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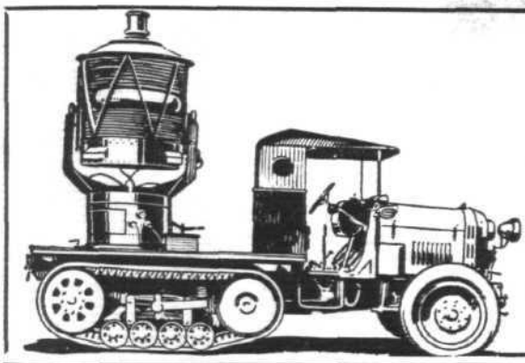
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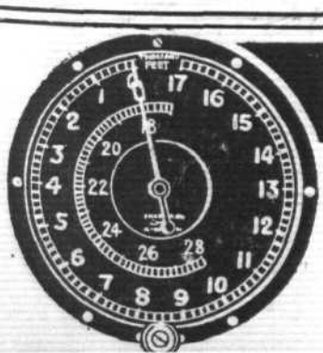
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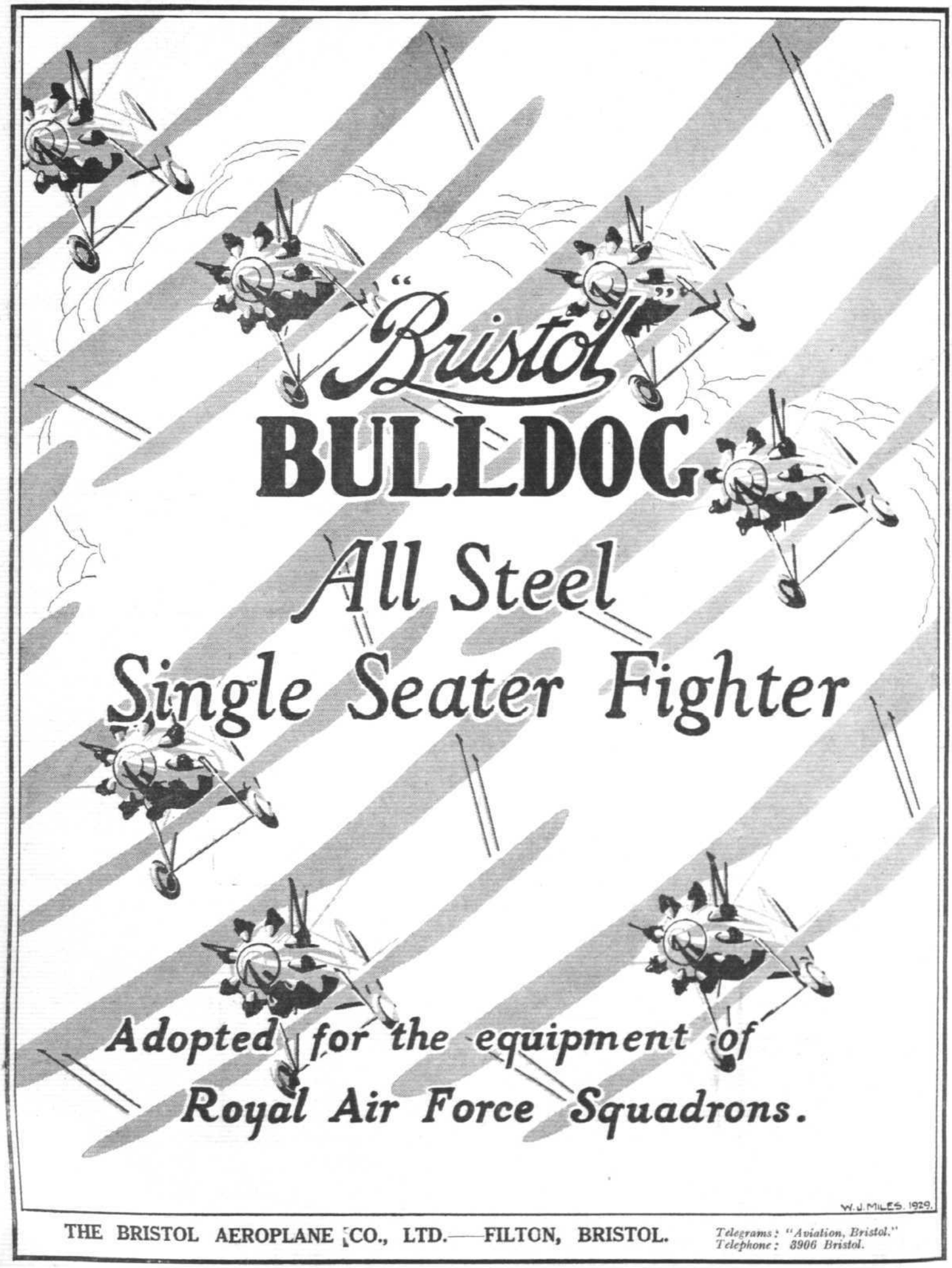


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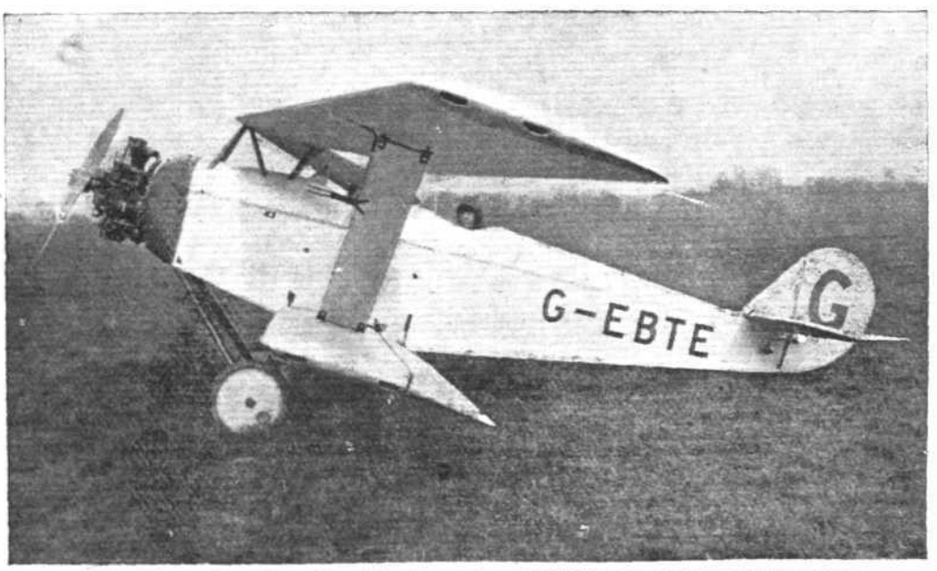
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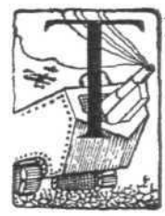
DIARY OF CURRENT AND FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list—

1929.

Mar. 29-30 Cinque Ports Flying Club Easter Meeting, Lympne.
April 11 Lecture, "Wind Tunnel Methods of the Eiffel Laboratory," by M. Lapresle, before R.Ae.S. and Inst.Ae.E.
April 18 Lecture, "R.101," by Col. V. C. Richmond, before R.Ae.S. and Inst.Ae.E.
April Exhibition of Sporting and Touring Aircraft, Switzerland.
May 21 Northampton Air Pageant.
June 19-22 F.I.A. Conference, Copenhagen.
June 27-30 Rotterdam International Air Meeting.
July 5-6 King's Cup Race.
July 13 R.A.F. Display at Hendon.
July 16-27.... 7th International Aero Exhibition, Olympia.
July 28 International Flying Meeting, Sweden.
Aug. 1-14.... French Light Plane Meeting, Orly.
Aug. 15 International Balloon Race, Poland.
Sept. 6-7 Schneider Trophy Race, Solent.
Sept. 10-20 Aero Club de France Meeting, Le Baule.
Oct. 1 Gordon-Bennett Balloon Race, St. Louis, U.S.A.
Oct. 31 Guggenheim Safe-Aircraft Competition Closes.

EDITORIAL COMMENT



THE subject of transatlantic flying is somewhat appropriate just now, partly because, apparently, the "silly" season for transatlantic aviators has started, as evidenced by the start, just as these notes are being written, of a Spanish flight across the South Atlantic, and partly in connection with a letter published in our Correspondence column this week, in which an American reader of FLIGHT brings up the subject.

Transatlantic Flying

The attitude of FLIGHT towards transatlantic flights is already well known. The crossing of the Atlantic has been accomplished, and we can see no useful purpose served by spasmodically repeating the feat. Our correspondent pleads for the inauguration of a flying-boat service between Newfoundland and Ireland, pointing out that the trail was blazed by Alcock and Brown, ten years ago. While that is perfectly true, it is an unfortunate fact that many of these trails refuse to "stay blazed," so to speak. The magnificent flight by Alcock and Brown, magnificent because it was the first to span the distance between Newfoundland and Ireland, demonstrated the possibility of accomplishing a flight from the New World to the Old. But many other attempts, about the same time and since, have demonstrated, equally convincingly, that the undertaking is attended by considerable risk, and that it is full early yet to talk of a *regular* and commercial service.

We should be the last to deny that very great progress has been made since 1919. Aero engines have become lighter, have better fuel consumption, and have become very much more reliable. Thus, as we said in another connection some time ago, the technical obstacles have, to a large extent, been overcome. We agree with our correspondent that the operation between Newfoundland and Ireland of a flying-boat service could now probably be undertaken with a fair amount of certainty if multi-engined flying-boats of large size were employed.

The Secretary of State for Air, Sir Samuel Hoare, has let it become known that England is about to produce, among other new types of aircraft, the

largest flying-boat ever built in this country. But it should be understood that such a craft must of necessity be of a somewhat experimental nature, and could not at once be put on a service such as that for which our correspondent pleads. As we have repeatedly pointed out in these columns, size as such is not necessarily an advantage as far as aerodynamic and structural efficiency are concerned, but it *is* a definite advantage in the matter of seaworthiness, which is, after all, largely a relative term and depending in no small measure on the relative size of waves and boat hull. A transatlantic flying-boat service would, therefore, have to use machines of fairly large size, and it is perhaps, doubtful whether any machines in existence would be quite large enough if they are admitted to be capable of the flight.

The technical possibility of the realisation of a Newfoundland-Ireland service is not, perhaps, so very far removed, but to be worth while such a service must be reasonably "commercial." Now, it is, of course, a fundamental truth that the longer the stages that have to be covered non-stop, or in other words without refuelling, the smaller becomes the "pay load." As time goes on, doubtless we shall make improvements which will enable us to cover longer stages with the same pay load, or conversely carry greater pay load over the same stages, but the main principle is not thereby altered. We fear it will be some time before such a service could be operated regularly, safely and with a pay load which would make it worth while.

Then there are the airships. Rightly or wrongly, Great Britain has decided to explore the possibilities of the rigid airship, chiefly because this is the aircraft in which, above all others, long distances may be covered while still carrying a fairly large pay load. Thus the situation may be summed up by saying that we are following two distinct lines of development: the flying-boat and the airship; the former is not quite developed to the stage where we can undertake really long services, and the latter has not yet emerged from its shed. Both types are being proceeded with, but it does appear likely that no very ambitious flying-boat scheme will be launched until we have had an opportunity to ascertain the capabilities of the airship. Should the latter prove a success, the flying-boat will take second place over very long ocean routes, but will be the predominating type over sea routes of a few hundred miles. Should, on the other hand, the airship prove a failure, the flying-boat will remain our only solution, and we shall then have to set about seeing what can be done. That, as far as we understand it, is the attitude of the British Government, and on the whole it is, we think, a sound one.

❖ ❖ ❖

In our issue of March 7, we published an illustrated description of the Burnelli monoplane, and in this week's issue some further illustrations are given.

Cabin Accommodation

This American machine has the appearance of a "freak" at first sight, but on closer examination it discloses features which are at least interesting. The first of the Burnelli types was produced several years ago, and was a biplane. It had a fuselage which was rectangular in plan view and of aerofoil section, and it was hoped that this type of fuselage could be made to "pay for its keep" by adding a certain amount of lift and thereby enabling the wing area to be reduced. How much there was in the original theory we do not know, probably not a great deal. But the latest edition, a monoplane, although having a fuselage of different shape, does seem to provide one thing which is not often found: extremely generous cabin accommodation. While we are not very optimistic in the matter of lift from a fuselage of such small "span," it does appear that the Burnelli arrangement gives the cabin space without losing its performance, and if it does nothing else, that is a good deal.

The figure given for top speed with two Curtiss "Conqueror" engines of about 700 h.p. each, maximum, is 145 m.p.h. The Everling "Wing Power" is 14·75 h.p. per square metre, and the "High-speed Figure" about 18·5, which is very good for a twin-engined aeroplane, indicating that the aerodynamic efficiency cannot be regarded as very inferior. In addition to the roomy cabin, the design has the advantage of engine accessibility, and altogether, in spite of the unorthodox design, the Burnelli seems to be a type worth watching.

◈ ◈ ◈ ◈

Air Force Tributes to the Late Marshal Foch

A DETACHMENT of two officers and twenty other ranks of the R.A.F. were amongst the British units at the funeral in Paris of the late Marshal Foch on March 26. H.R.H. the Prince of Wales represented the King, and other distinguished officers present were: Marshal of the Air Force Sir Hugh Trenchard, Field-Marshal Sir George Milne, Lord Methuen, Lord Cavan, Viscount Allenby, Sir Claud Jacob, General Hutchinson, Admiral Lord Wester Wemyss, Lord Plumer and Vice-Admiral Haggard.

Air Mails to the East

THE Postmaster-General announces that the through Air Service between this country and India, which will commence on Saturday, March 30, will be available for all classes of postal packets, except parcels. Packets may be registered, but not insured at present. The countries served by the new service are, for the present, Egypt, Palestine, Iraq, and India, and the times of transit are expected to be approximately as follows: to Alexandria, 4 days, as compared with 6 to 8 days by ordinary route; to Gaza, 4½ days, instead of 7 to 9 days; to Baghdad, 5½ days, instead of 23 days (via Bombay); to Basra, 6 days, instead of 22 days (via Bombay); to Karachi, 7½ days, instead of 16 days; to Bombay, 10½ days, instead of 14½ days. The air fees, to be prepaid by ordinary postage stamps in addition to the ordinary postage and registration fee, if any, are as follows: to Egypt and Palestine, 2½*d*. per half oz.; to Iraq, 4½*d*. per half oz.; to India, 6*d*. per half oz. Letters for transmission by this service should bear in the top left-hand corner the blue air mail label, or be clearly marked "By air mail." They may be posted in the ordinary way. The latest time of posting at the General Post Office, London, will be 6 a.m. on Saturdays.

Air Transport Bills

THE Joint Committee of the Lords and Commons appointed to consider the Air Transport Bills promoted by the Great Western, the Southern, the London and North Eastern, and the London Midland and Scottish Railway Companies, will hold their first meeting on April 16. The five members who will represent the House of Lords are:—Earl Westmorland, Viscount Novar, Lord St. John of Bletso, Lord Clanwilliam and Lord Kintore. The five members appointed by the Committee of Selection to represent the House of Commons are:—Sir Ernest Craig, Mr. Dunnico, Mr. L'Estrange Malone, Sir Clive Morrison-Bell, and Sir Walter Preston. The chairman will be chosen at the first meeting of the Committee.

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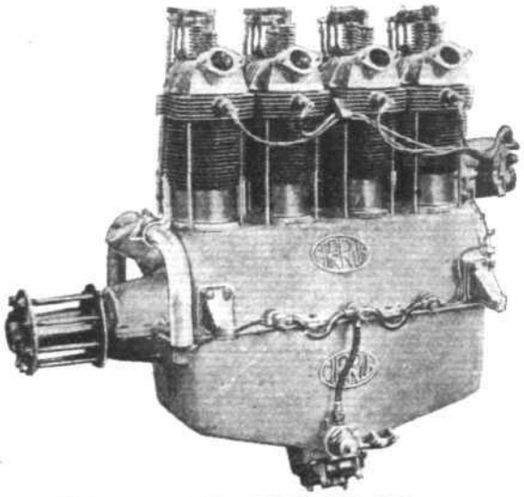
CIRRUS ENGINE.

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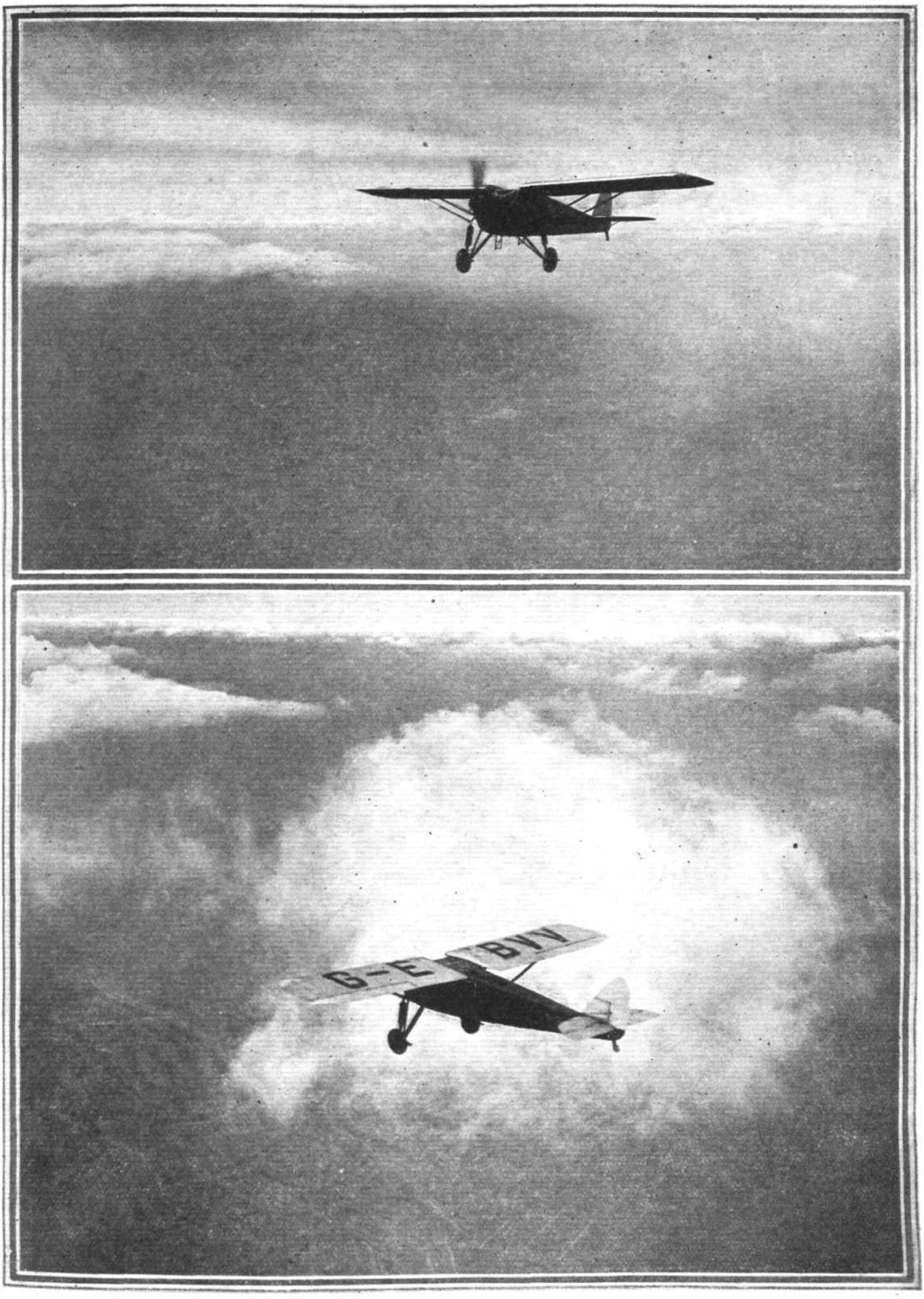
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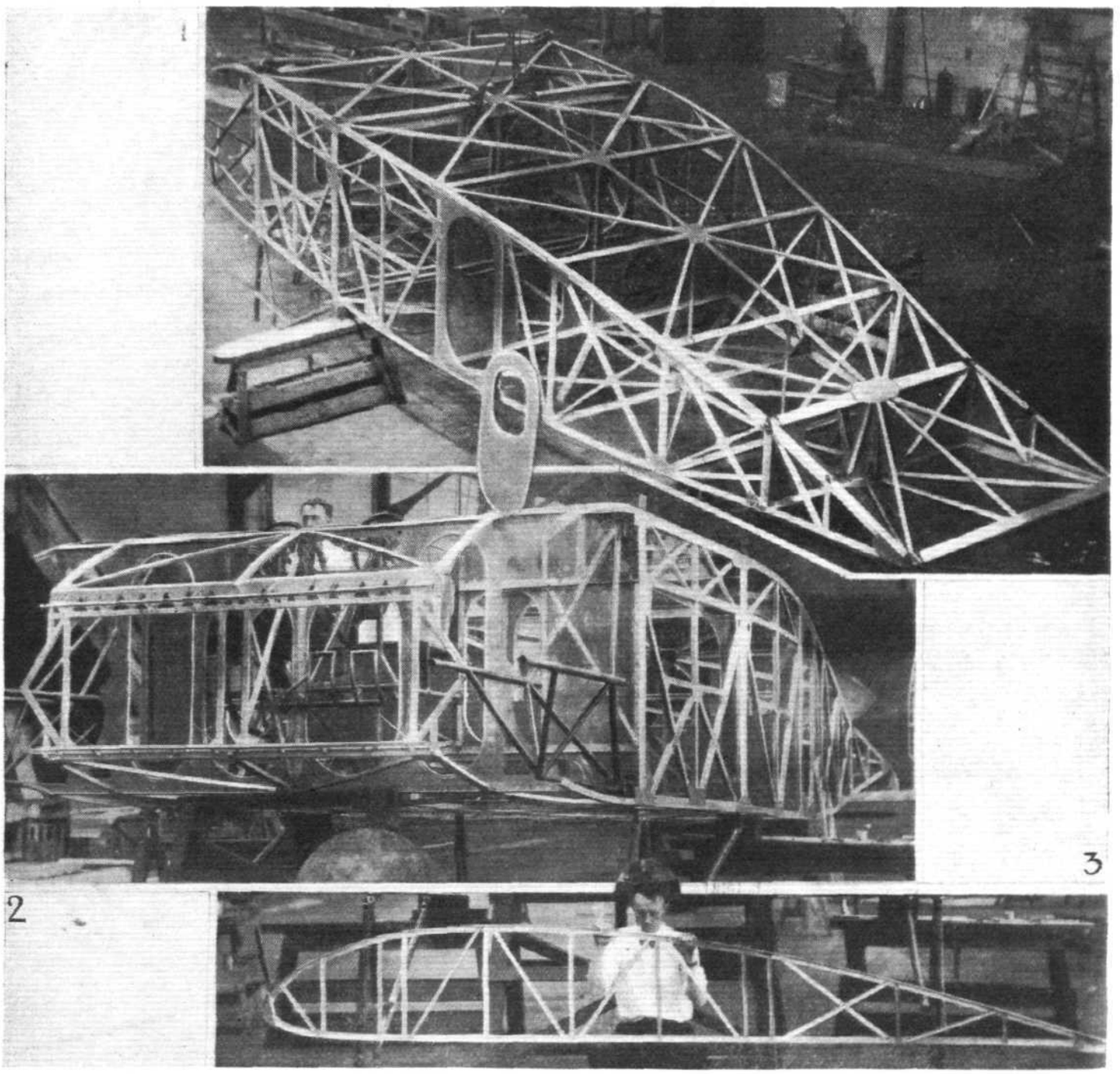


["FLIGHT" *Photographs*

THE NEW DE HAVILLAND "HAWK MOTH": These photographs were secured recently while the machine was on a test flight. The "Hawk Moth," which is fitted with a De Havilland "Ghost" engine, was described and illustrated in "Flight" of February 7, 1929.

AN ORIGINAL DESIGN

Further Details of the Burnelli Monoplane



IN our issue for March 7 last we published a brief description, together with illustrations, of a new American commercial monoplane, the Burnelli, of somewhat original design. This week we are able to supplement our description with the accompanying detail photographs on this and the following page.

The outstanding feature—apart from being of all-metal construction—of the Burnelli monoplane, it will be remembered, consists of the wide, aerofoil-section fuselage. The advantage claimed for this arrangement is that it not only provides a maximum of space for passengers or freight, but the aerofoil section acts, so to speak, as surplus wing area with sufficient lift to carry its own weight. A more satisfactory arrangement of engine installation is also obtained.

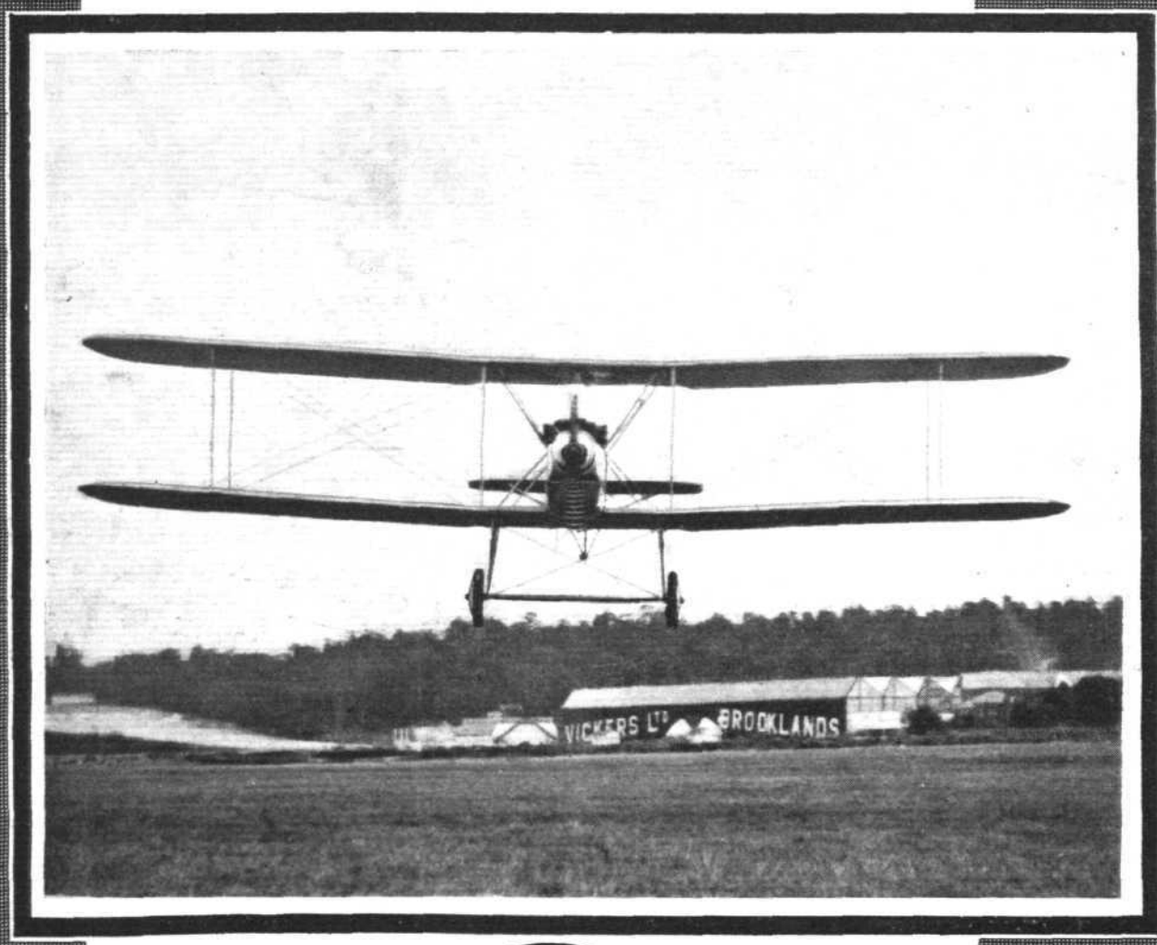
Having thus again run briefly over the main feature of the Burnelli monoplane let us now refer to the chief points of interest in the accompanying illustrations. Figs. 1 and 2 are skeleton views of the fuselage, which is constructed of extruded dural, heat treated, drawn to various sections—angles, tees and channels—built up into a truss framework which is covered with corrugated dural. Fig. 2 clearly shows one of the two tubular steel engine mounts. These are pivoted in the front " corners " of the fuselage, and are not only detachable but can swivel outwards, thus facilitating engine replacement and adjustment. In addition, the engines (two 500-h.p. Curtiss " Conquerors ") are " getatable " from inside the fuselage. The dual controls are also shown in this view.

Fig. 3 is one of five " former-ribs " used on each wing panel, also made of extruded dural, which support the lateral stringers to which the corrugated sheet dural is fastened. There are no other ribs, as in orthodox wing construction, the shape of the wing being maintained by these former-ribs and stringers built up around the main spars. Drag trusses are used at intervals.

Fig. 4, on the next page, is a view of the Burnelli monoplane itself, being flight-tested by Lieut. Leigh Wade at Newark (N.J.) airport. The heads of the pilots are clearly seen, thus illustrating the good range of vision obtained. The landing wheels may be retracted into the fuselage, as shown in one of the illustrations in our previous description of this machine.

Fig. 5 is a view looking forward inside the cabin, which can accommodate 20 passengers. At the head of the cabin are the two windows immediately behind the pilots' seats, and on the pillar in the centre are mounted altitude and speed indicators

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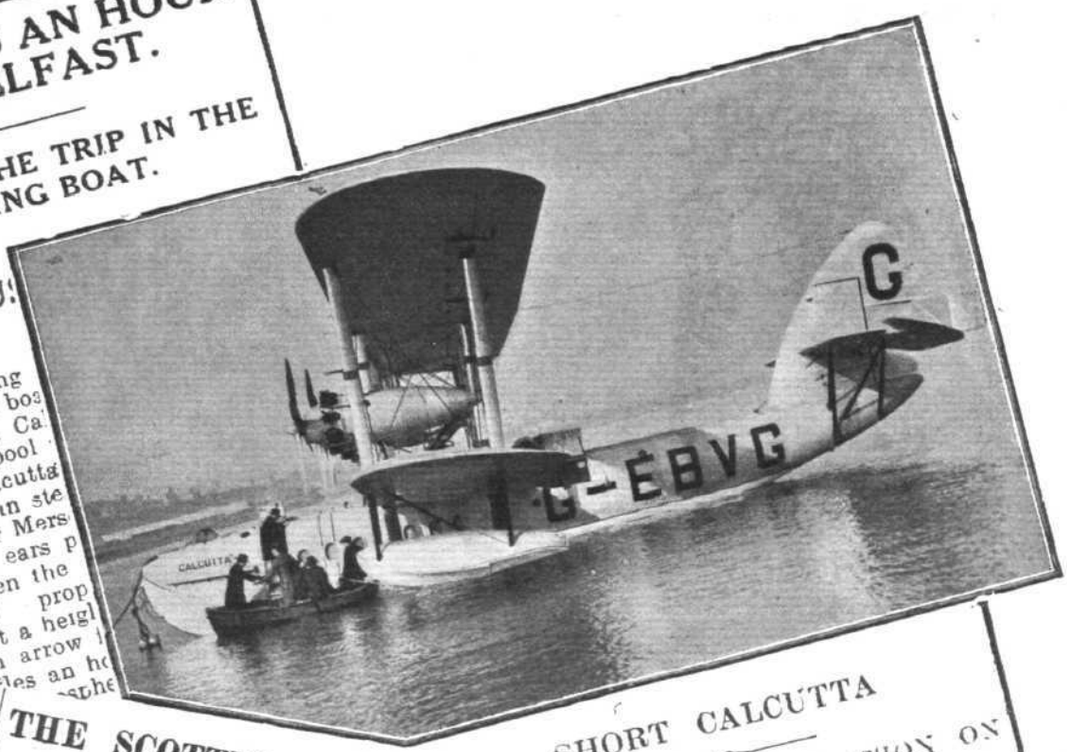
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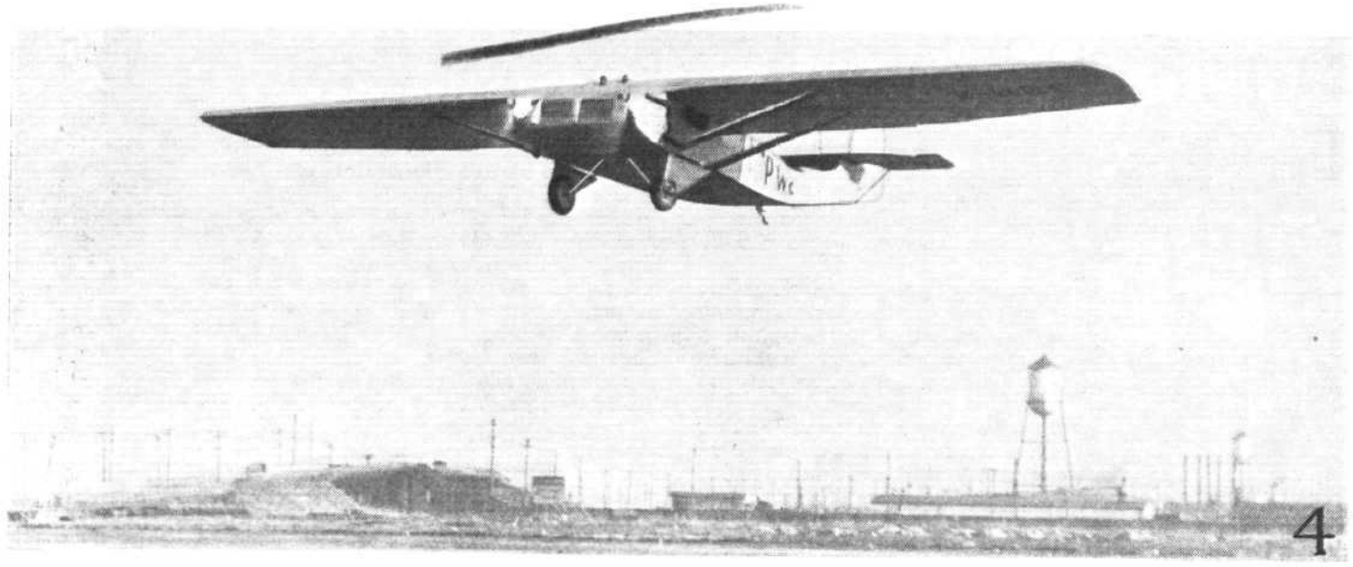
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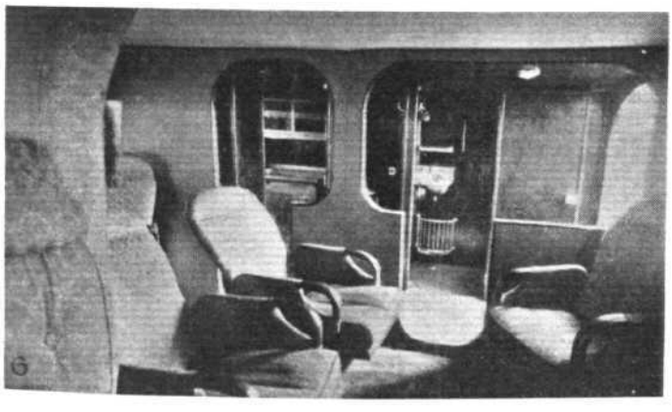
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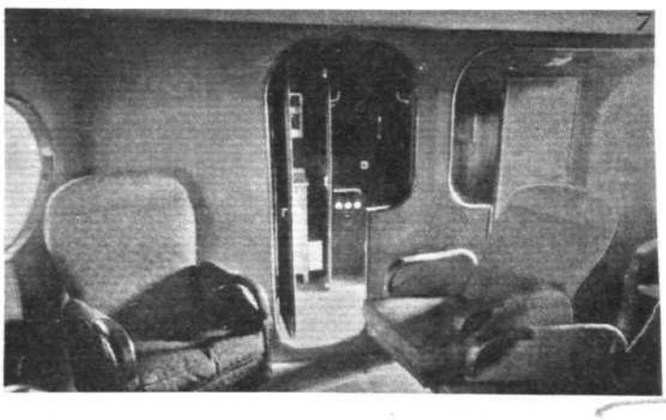
An order for a third all-metal "Calcutta" has been placed by Imperial Airways

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for use of the passengers. The large lounge in the centre is arranged on top of a 400-gallon petrol tank (there are also petrol tanks in the wings).

Figs. 5 and 6 are two more interior views, looking aft, on the port and starboard sides respectively, showing, behind the main cabin, the compartments arranged for toilet, kitchen, and wireless. The woodwork of the cabin is walnut and the finish is in grey.

WESTERN CANADA AIRWAYS CARRIES ON

TO those who are accustomed to thinking of the savings effected by air transport in terms of hours, or at the most, days, the vast economy of time attained in north-western Canada must seem almost fantastic.

There it is that this new industry shows the most remarkable contrasts with the older and hitherto only available forms of travel.

Pitted not against railways and fast steamships, but against the two primitive northland methods of transportation, the canoe and the dog-team, it is no wonder that the aeroplane is able to cut off not only days, but weeks, and in some instances even months. A recent example will serve perfectly to illustrate this statement.

On January 23 last, a Western Canada Airways' Fokker Super-Universal set out from Waterways, the northern terminus of the Alberta and Great Waterways Railway, 305 miles from Edmonton, for Fort Smith, some 400 miles still farther north. The arrival of this machine rejoiced the inhabitants of the little Mackenzie River settlement with their Christmas mail.

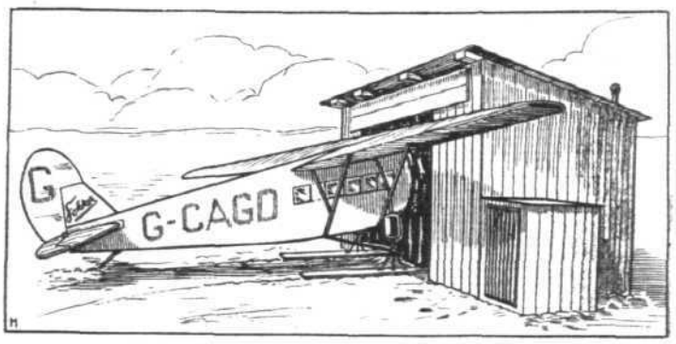
The last previous mail delivery at Fort Smith was in September, and but for aircraft, the Christmas mail would not have arrived before next June, when the river steamers start to run for their short summer season. Passengers, furs and mail constituted the return cargo, and the trip is scheduled to be a weekly one in future.

Western Canada Airways, the sponsors of this service, have played and are playing a very important part in the development of the northland. Commencing operations upon the arrival of their first Fokker Universal at Hudson, Ontario, on Christmas Day, 1926, within a few months they were bringing in two more similar machines. With these three machines, in the period ending April 30, 1927, the company carried 250 passengers, 50,000 lbs. of freight, and flew 34,000 miles. The operations included the transportation of 14 men and eight tons of material (including 800 lbs. of dynamite) from Cache Lake, at the head of construction on the Hudson's Bay Railway, to Fort Churchill, and the successful completion of the contract made possible the subsequent decision to make Fort Churchill the ocean terminus of the railroad.

In the summer of 1927, during which time the fleet was increased to seven machines, Western Canada Airways carried 950 passengers, 240,000 lbs. of freight, and flew 120,000 miles. One of the outstanding single achievements of that year was the transportation of 40 men and 35 tons of material, including petrol, diamond drills and other mining equipment to Cold Lake for the Sherritt-Gordon Mines, Ltd.

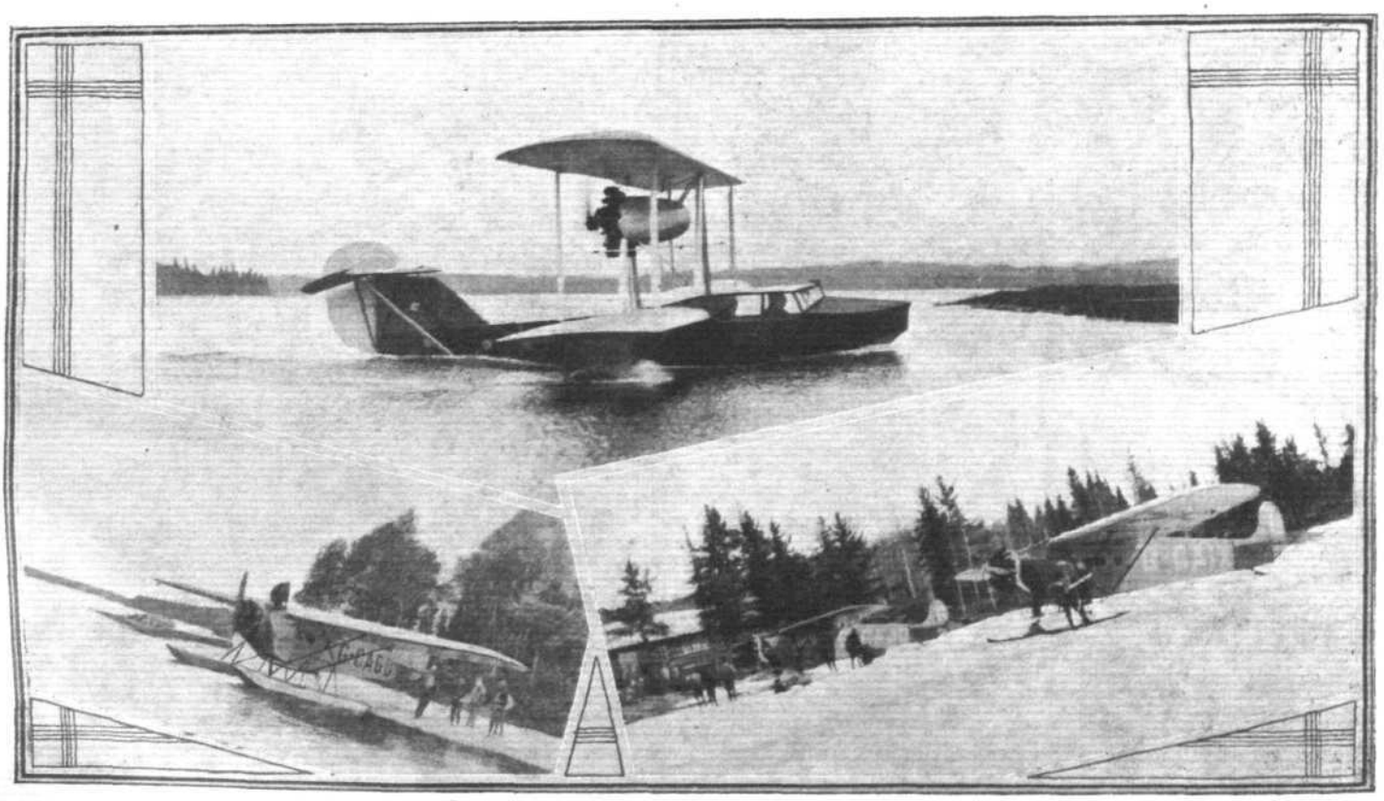
The country over which most of this work was done is extremely difficult for surface travel. In the summer it is largely muskeg, or swampy, broken ground, dotted with lakes and watercourses. Canoes are the only practicable means of ground transportation, on account of the frequent portages between separated bodies of water. In the winter dogs are used.

Vast mineralised areas abound, many of which had never been prospected. Fur-producing empires, hitherto reached, if reached at all, by long and arduous dog-team journeys, are now within a few hours' flight of the main-line cities of the Dominion.



A "NOSE-BAG HANGAR": Our sketch shows an ingenious arrangement whereby Western Canada Airways can carry out minor repairs and adjustments to the engine in comparative comfort during winter conditions. Orthodox hangars are few and far between, but these small huts can be put up almost anywhere.

Floats are universal equipment in summer, and skis are used in winter, the flat surfaces of the many lakes, whether liquid or frozen, providing ideal aerodromes throughout the year, except for brief periods in autumn and spring, when the ice is forming or breaking up. Needless to say, hangar accommodation is rarely available, which has led to the



WESTERN CANADA AIRWAYS: Some of the machines employed by W.C.A.; (Top) A Boeing flying-boat, based on Vancouver. (Left) **The summer base at Opawika Lake, with a Fokker "Universal" fitted with floats.** (Right) Fokker "Universals," **fitted with skis, on the frozen surface of Cold Lake.**

SEGRAVE'S SPEED SUCCESS

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"Napier engine in Irving-Napier Special gave entire satisfaction throughout practice and during world's record run to-day."—SEGRAVE

Major H. O. D. SEGRAVE, at Daytona Beach on March 11th, with his Irving-Napier racing car, fitted with Napier aero engine, similar to that which won the Schneider Trophy in 1927, set up a World's Speed Record on land by covering 1 mile at the average speed of—

231·36 m.p.h.

Flight-Lieut. D'Arcy Greig, with a Supermarine seaplane fitted with the same type of Napier aero engine, in November last achieved the highest speed ever attained in the air, namely—

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Napier aero engines were installed in the 4 Supermarine "Southampton" flying boats which flew from England to Australia and back to Singapore.

180,000 engine miles

were covered without mechanical trouble, setting up a record of reliability unapproached by any other engine. To quote the "Aeroplane" of Jan. 16th—"The greatest achievement yet in aviation."

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introduction of the "nose-hangar," a small warmed shed into which the engine of a machine can be introduced through canvas curtains, enabling the mechanics to work in comparative comfort, whatever the weather conditions may be outside.

The company have found the all-weather characteristics of the Fokker machines, with their plywood-surfaced planes, so satisfactory for this type of work, that they are now operating, as part of their fleet of 30 machines, 10 Universals, 8 Super-Universals, and 1 tri-motor of this make. A Junker machine is on order at the present time.

To James A. Richardson, the owner of the company, and President of James Richardson and Sons, well-known members of the Winnipeg Grain Exchange, is due the credit for the initiation and rapid expansion of the company, the head office of which is in Winnipeg. Bases are located at Sioux Lookout, Gold Pines, and Allan Water, in Ontario; at Winnipeg, Lac du Bonnet, the Pas and Cranberry Portage, in Manitoba; at Regina and Saskatoon, in Saskatchewan; at Calgary, Edmonton, and Waterways, in Alberta; and at Vancouver and Prince Rupert on the coast of British Columbia.

The Pacific Coast operations at present consist of the Fisheries Patrol, carried out for the Dominion Government, from May to November, and custom flying, but there is a generally held belief that these activities will expand in due proportion to those on the Prairie. There are numerous openings for mail and passenger services at the Coast, and the company is well aware of the prospects. Boeing boats are standard equipment for this work.

All the later Supers have been bonded for wireless, and the company maintains a short-wave transmitting station of its own at the Pas, while Sherrit-Gordon Mines also have one at Cold Lake.

Minor mishaps are all in the day's work, which is natural when taking into account the wild territory into which much of the service extends, but the company piled up the notable record of flying over 545,000 miles last year, without injury to any passenger.

A. H. S.

◈ ◈ ◈ ◈

THE PROGRESS OF CIVIL AVIATION IN CANADA

Increased Activity in all Spheres During 1928

FROM the general and active preparations of the past winter the coming season is going to be a very active one from the standpoint of aviation, which is in every consideration to be expected after the remarkable progress of the past few years. The general adoption of the machine of the air into all phases of Dominion life and the steadily growing airmindedness of the Canadian people have been much in evidence. According to the Department of National Defence a grand total of 51,868 Canadians flew last year as passengers over the various air routes through the Dominion, and the total distance flown was about 4,000,000 miles. This is a record which would have been undreamed of a few years ago. At the end of 1928 there were three times the number of 'planes in operation than there were at its beginning, while air harbours had practically doubled and there were nearly five times as many licensed pilots. The prophecy is made that by 1930 Canada will have a thousand 'planes and a thousand pilots to fly them, which will mean no more than a continuance of the progress made in the past couple of years.

Flying Clubs

The inauguration of flying clubs by the Dominion Government last year has been an effective factor in turning out a fresh supply of expert flying men and creating a demand for light aeroplanes all over the Dominion. Gratification is expressed by the government over the success of these clubs to date, the aircraft issued by the government being in constant use and the average daily flying time high. Sixteen clubs have been granted 'planes under government conditions, and these operate 34 aircraft, 29 of government issue and five which they have provided themselves. Flying time in 1928 was 8,125 hrs., a total of 25,357 individual flights being made, and 139 pilots' licences issued. It is to be noted that a British firm manufacturing light aeroplanes and induced to locate in Canada by the increasing demand of this type of machine for light aeroplane clubs and for individual use delivered 62 'planes in 1928, and at the beginning of 1929 had orders on hand for more machines than total deliveries in the previous year.

Air Mails

As far as the air mail is concerned the operation of established services has been attended with every success and this is now a regular feature of Canadian life. Interest at the present time centres upon the extension of these services to Western Canada which, after the successful experiments of the past winter and the assurances given last year, is regarded as a practical certainty at a very early date. Increases in the appropriations brought down by the Post Office Department and the National Defence Department can be interpreted in no other way, these being more than sufficient to cover all contracts for the western services and for the construction of beacons and emergency landing fields along the 1,200-mile route from Winnipeg to Calgary, and north from Regina to Saskatoon and from Calgary to Edmonton. The Canadian air mail has under peculiarly difficult conditions developed with remarkable rapidity and efficiency, and a coast to coast linking in this manner can now be said to be definitely within sight.

Commercial flying in making great progress, and in addition to the expansion of existing companies new ones are coming into existence to meet requirements, or are projected. The greatest distance flown by any one company in 1928 was 545,009 miles, approximately one-quarter of the total distance flown by commercial companies in that year, which was accomplished by the Western Canada Airways, an organisation practically Dominion-wide. To accomplish this record pilots operating from various bases made 9,994 flights occupying 687,035 hours.

The operations of this company drew attention to what is probably the most revolutionary phase of Canadian aeronautics at the present time, the conquest of the great hinterland of the north. This company operates for the main part into newly developing mining camps remote from modern transportation facilities, though it also carried out the experimental mail services in Western Canada in December last, and mining authorities in Manitoba have paid the 'plane the tribute that it has been responsible for pushing the development of certain sections of the province ahead by twenty years. The company is steadily extending its services to the mining industry, a base having recently been established at Prince Albert to serve the new Bottonstone Lake mining country of Northern Saskatchewan, and another to serve the Chibougamon mining country of Northern Quebec.

Mineral Exploration

The initial success of the 'plane in preliminary mineral exploration foreshadows a good deal of a revolution in this phase of the mining industry. The Northern Aerial Minerals Exploration, Ltd., the first organisation to make extensive use of the aeroplane in mineral prospecting, concluded a very satisfying season in 1928 with several discoveries from bases established in the far north. The company operated seven 'planes, had eight licensed pilots, and five licensed engineers, and 25 bases and gasoline and provision caches have been established across the northland from Labrador to the Pacific ocean. Preparations have been made for a yet more vigorous programme of operations this year. The Dominion Explorers' expedition made with two 'planes flown direct from New York to a base some 130 miles south of Chesterfield Inlet was successfully and satisfactorily concluded in its first season, more than 3,000 miles being flown without mishap though many of the flights were over the barrens, beset with many hazards. The work of the 'plane in the preliminary phases of the mining industry has been successfully pioneered and a steady expansion in this utilisation is to be looked for.

Nothing so definitely foreshadows the great future awaiting aviation in Canada as the manner in which provision is being made for the consumption in years to come. A feature of aeronautical development recently has been the establishment and expansion of the aircraft manufacturing industry. As a result of the recent amalgamation of United States and Canadian aircraft interests the Curtiss-Reid Aircraft Company is erecting a large new factory to cost approximately $153,000 on the outskirts of Montreal, which is expected to be ready by June of this year. At the same time the Fairchild Aviation Corporation has definitely decided to establish a manufacturing plant in the province of Quebec, probably at Montreal, to produce its 'planes for Canadian consumption. Indications have quite recently been given that the Canadian manufacturing industry will find a profitable outlet for its product in other countries of the British Empire as well as elsewhere.

AIRISMS FROM THE FOUR WINDS

African Service Flight

THREE of the R.A.F. Fairey 111F (Napier "Lion" engines) engaged on the annual flight to Cape Town and back, arrived at Nairobi on March 24 with three S.A.A.F. machines. These South African service aircraft made a fine flight of 900 miles from Abercorn to Nairobi in one day, in order to catch up with the R.A.F. machines.

The Flight Towards Australia

FLIGHT-LIEUT. J. MOIR and F./O. H. Owen, who left England in the Vickers "Vellore" (Armstrong-Siddeley "Jaguar") for Australia on March 18, left Benghazi, on the North African Coast, on March 22, but were forced to land at Mersa Matruh, about 160 miles west of Alexandria. The extent of the damage is not known yet in this country, but assistance is being sent to the airmen from London. If the machine is repairable there, then the flight will be resumed. The progress of the airmen before their mishap was as follows: March 18, Marseilles; March 19, Rome; March 20, Malta; and Benghazi the next day. Their engine was then reported to have run faultlessly.

Capt. Lancaster's Flight

THE last report of Capt. W. N. Lancaster's progress, on the 10,000 miles tour from New York to South America and back in the Cirrus-Avian, was that he had reached Guadeloupe, on the chain of West Indies which circles to the mainland of South America. His next stages are also sea flights to Martinique, Trinidad and Georgetown. He is competing for a gold medal offered by the Central Union Trust Co. of America for the first light 'plane flight over the route mentioned. One believes he carries a raft as a precaution for his sea stages.

Light 'Plane Flight to S. Africa

SQDN.-LDR. L. H. SLATTER, who is flying to S. Africa from England in a Blackburn "Bluebird" (D.H. "Gipsy"), reached Mersa Matrah on March 21, and continued towards Aboukir, the next day. On March 23 he reached Cairo.

Madrid-Brazil Flight

SPAIN is attempting a non-stop flight to S. America. A Spanish-built Breguet 19 (600 h.p. Hispano), left Seville in the evening of March 24, flown by Capt. Jiminez and Capt. Iglesias. It carried a rubber boat, 907 gallons of petrol and 71 gallons of oil. The machine was reported off Cape Juby later. Its arrival over Natal was reported on Tuesday evening. Naval vessels were ordered to keep a sharp vigilance. The same Spanish airmen tried to set up a non-stop record last year in a similar machine.

Graf Zeppelin's Tour

AT 12.45 a.m. on March 24, the *Graf Zeppelin* left Friedrichshafen on its Mediterranean cruise. Over 16,000 letters and postcards were carried. Mail will be dropped at Jaffa for the near East, and at Athens, Budapest and Vienna. Twenty-five passengers and a crew of forty are on board. Amongst the passengers are Herr Koch, Minister of Justice; Herr Lobe, President of the Reichstag; and Herr von Guerard, the recent Minister of Transport. The airship passed over Marseilles via the Rhone at 8 a.m., and was sighted at Rome by 3.15 p.m. It descended to a low altitude and dropped a message in German national colours. On the course next taken to Naples it was escorted a short distance by Italian light aeroplanes. It was over Naples by 5.30 p.m. The cruise is expected to last about four days and cover 5,000 miles. Distance flown to Naples was about 800 miles.

Some Striking Statistics

EUROPE'S passenger air fleet at present numbers 730 passenger aeroplanes with an aggregate power capacity of 358,935 h.p., according to an article in the latest issue of *Flygning*, the official organ of the Royal Swedish Aero Club and of the Swedish Air-traffic Society. The author as a comparison, points out that the power capacity of the European air fleet corresponds to no less than that of 16 modern ocean liners of the size of the *Kungsholm*, the latest and largest ship of the Swedish-American Line. At the present time regular passenger, mail and goods traffic is maintained by 25 different air traffic companies, representing 15 countries, which figure, however, does not include Russia, from where the author has been unable to obtain the necessary information. Of the entire air fleet, 577 aeroplanes have one engine, 71 have two engines, 63 three engines, and 19 four engines. Thus, of all planes, 21 per cent. have more than one power unit. The 730 aeroplanes have been built by 29 different factories and represent no less than 67 different types, which shows the keen competition existing between the various manufacturers. The author states that standardisation is progressing rapidly and that within the near future the number of types will be considerably reduced. The general tendency in the development of the industry is towards bigger machines and more powerful motors. Another interesting feature is the probability that the Diesel engine will soon compete seriously with the types now used, and the author is of the opinion that once the Diesel engine has proved its efficiency for aviation purposes it will quickly eliminate the petrol engine, owing to its smaller fuel consumption and to the fact that it uses fuel which is 50 per cent. cheaper and which considerably reduces the danger of fire.

Lady Bailey—Premier Airwoman

ON March 25, the Hon. Lady Bailey was the guest of the Sports Fellowship at the Stadium Club, Holborn. She was introduced by Lord Decies, who said that Lady Bailey was the premier airwoman of the world.

French Honours for Lady Bailey and Senor de la Cierva

THE French Academy of Sports has awarded its Grand Prix for 1928 to Señor de la Cierva for his Autogiro machine. And one of its five gold medals has been awarded the Hon. Lady Bailey for her solo African flight.

Air Line Performance

AN Imperial Airways air liner flew from Basle to Liverpool in 10 hours. The actual flying time was 7¾ hours.

Prague-Rotterdam-London

ON April 2 next an air line between Prague and Rotterdam will start, connecting the line from London.

London-Brussels Night Services

ATTEMPTS to run a night air service for mails between London and Brussels will be made in July.

Subsidy for Cape Service?

MAJOR HUDSON, Rhodesian Minister for Defence, states his belief that the Government will do all it reasonably can to subsidise the proposed Imperial Airways service to Cape Town.

Death of Atlantic Flyer

THE death is reported of Maj. W. N. Hensley in America. He flew to England in the R.34 in July, 1919, and was thus the first American to fly non-stop between the two countries. He was 48 years of age and trained as an airship pilot in Germany. He was also an aeroplane pilot.

Brussels Aviation Conference

TWENTY-SIX States were represented at the fifteenth session of the International Committee on Aerial Navigation (established in accordance with the Air Convention of October 13, 1919), which has just been held in Brussels. The British delegates were Air Vice-Marshal Sir Sefton Brancker and Capt. M. H. J. Goodman Crouch.

Weisbaden Aerodrome

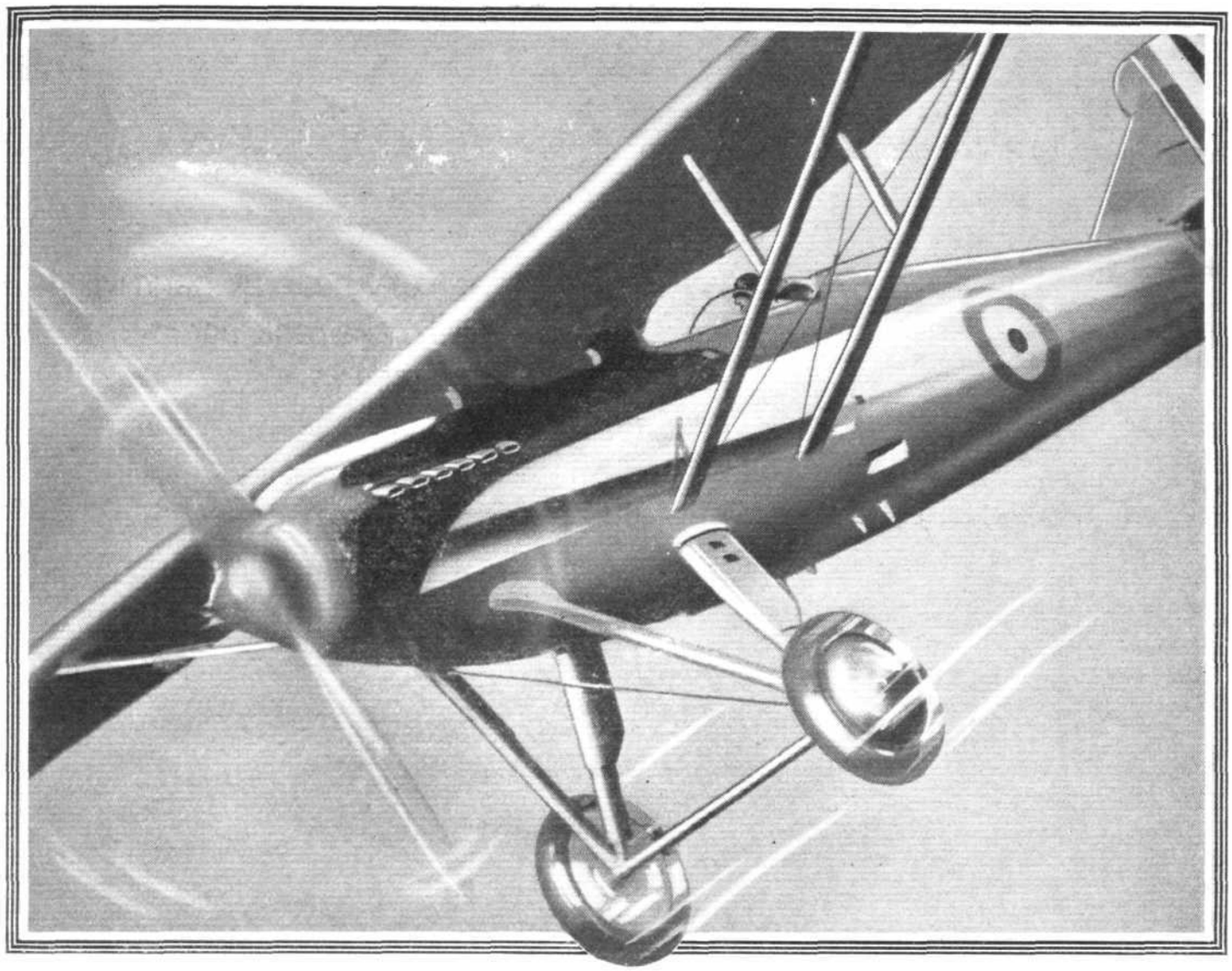
A NEW landing ground for aircraft in the vicinity of Weisbaden will be available at Whitsun.

Club for Ilford?

A FLYING club is being proposed for Ilford, and also an air port.

Air Mail Robber.

THE *Daily Telegraph* recently gave the following story: "Here is the solution of a mystery which not long ago caused something approaching consternation at the Air Ministry.—The mails which were being sent to India by the new air route for a reason not hitherto publicly explained were, in part, at least, irreparably damaged before they could be delivered. At first various forms of foul play were suspected, but later it transpired that a young female, called Lindy, was to blame. She had been the very special property of a young Air Force officer stationed in Irak, and became so popular with all the squadron that when duty recalled him to England Lindy remained behind. Whether she suspected that the new air mail might bring a letter from her master history does not relate, but certain it is that she entered the orderly room and methodically inspected and destroyed the mail. Severe disciplinary action was contemplated, but Lindy, which, by the way, was not her real name, forestalled justice by dying of pneumonia. Incidentally, it should perhaps be added that she was of pure Simian descent.



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The AIRCRAFT ENGINEER

FLIGHT ENGINEERING SECTION

Edited by C. M. POULSEN

March 28, 1929

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EDITORIAL VIEWS.

Probably no other single item of an aircraft has come in for as much discussion as has the cantilever wing. One "school" regards it as the be all and end all of the efficient aircraft, while the other can see no advantage whatever in it. Proofs have been adduced both ways, and as yet the old problem "Monoplane or Biplane?" seems to be as far from a solution as ever. Our own views, which we have stated repeatedly, are that in all probability there is, when all factors are taken into consideration, very little to choose between the two from the pure aircraft point of view, and that in most cases practical considerations only indirectly connected with the aircraft, *per se*, will determine the choice. That the cantilever wing is slowly beginning to gain favour among British designers is evident. Where, a few years ago, one never met with a British machine with this type of wing, there are now several in existence, or contemplated, which incorporate either the pure cantilever wing or its compromise version, the "semi-cantilever" wing. British designers as a whole have not had great experience of this type of wing, and it is felt that the article by Mr. Duncanson, this week, should be of considerable assistance in enabling the effects of changes to be rapidly estimated. Thus, in getting out a new design, the work of estimating what will be the effect of alterations in span, loading, etc., is greatly facilitated.

Mr. Duncanson, who is now on the Technical Staff of the Gloster Aircraft Co., Ltd., has for a number of years been engaged in stress work, and the approximate method which he has evolved for application to the cantilever wing therefore has a lot of practical experience behind it.

By now, there are relatively few British aircraft firms which do not possess their own wind tunnels, and the usefulness of this aid to aerodynamic design is generally recognised. In the design of the new installation of Armstrong-Whitworth's, at Whitley, several novel features were introduced, and we have been fortunate enough to obtain from Mr. R. Reynolds a description of the equipment. Mr. Reynolds, it might be added, designed and supervised the construction of the Whitley tunnel, of which he is now in charge. His previous experience at Handley Page's and the R.A.E. stood him in good stead, and the Armstrong-Whitworth tunnel is one of the most up-to-date in the country.

CANTILEVER WINGS.

A Conventional Method of Strength Analysis.

By F. DUNCANSON, B.Sc., Wh.Ex.

When designing cantilever wings it is often necessary to investigate the effect, structurally and aerodynamically, of variations in the geometrical form, such as plan shape, aspect ratio, wing section thickness, etc., in order to arrive at wing proportions best suited to the purpose for which the aircraft is intended.

For instance, if the main purpose of the aircraft be the attainment of high speed—a fairly high landing speed being permissible—the wing section chosen should be as thin as possible, whereas if the main purpose should be high ceiling, a thick wing section would be more suitable. A similar consideration applies to the selection of the aspect ratio of the wing.

In general, wings should be of high aspect ratio and thin section to attain good aerodynamic efficiency, but they should be of low aspect ratio and thick section to attain light structural weight.

The foregoing remarks are, of course, subject to practical limitations, such as, for instance, bending and torsional stiffness.

By means of the following suggested method of structural calculation it is possible rapidly to obtain comparative results due to variations of the geometrical proportions of cantilever wings: the method may therefore be useful for exploring the possibilities of various wing forms in the initial stages of a new design.

The weight of wing spar obtained from these calculations represents the minimum weight attainable under the ideal conditions of uniform stress throughout the material and the use of a wing section having a stationary C.P. How closely to this ideal an actual spar may be made depends upon the methods of detail design and the C.P. travel of the wing section used.

The convention employed in this method is to make the plan form of the wing expressible as a simple mathematical formula, *i.e.*, the chord y, at any point, x, along the span may be expressed as: Const. $\times x^{\frac{1}{n}}$.

By the application of very elementary calculus this expression may be successively integrated to give formulæ for the load per foot-run along the spar, shear force, bending moment, flange and web sizes, and finally, the weight and deflection of the spar under load.

Most cantilever wings are of tapered plan form with rounded tips, and by suitable selection of the value of n the

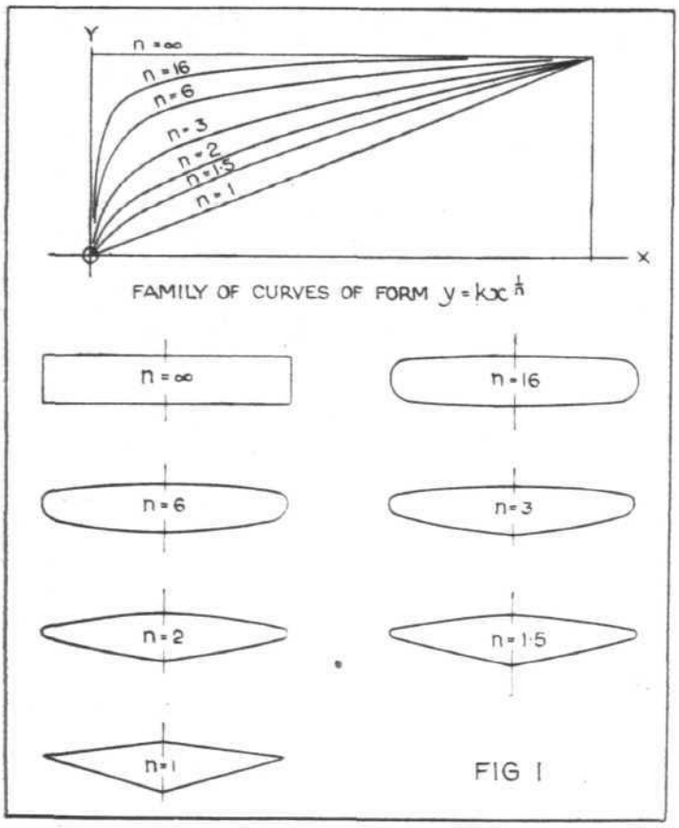


FIG 1

expression $y = kx^{\frac{1}{n}}$ may be made to fit any plan form with a fair degree of accuracy.

Fig. 1 shows a family of curves plotted for various values of n, together with pictures of the actual wing shapes corresponding with these plan form expressions.

To facilitate construction, it is usual to make the leading and trailing edges straight and to fit circular arcs tangential to these edges to form the rounded tips. Fig. 2 shows the degree of approximation to this particular plan form that the parabolic curve will attain. There is no reason why the tip shape should not be of approximately parabolic form, blending into the leading and trailing edges at points A and B instead of being defined by the circular arcs R and r. In this case a structure designed according to the assumption that the plan form is as shown dotted in Fig. 2 would be on the safe side as regards strength.

The next question to be determined is whether it will be satisfactory to assume that the load distribution along the wing is proportional to the chord.

An answer to this may be found by referring to N.A.C.A. report No. 150, which gives the results of pressure distribution tests on a series of wing models, starting with a rectangular plan form and progressively tapering to a triangular plan. In this series of tests the wing thickness to chord ratio was made constant. Particulars taken from this report are shown on Fig. 3, which illustrates the effect of taper on the lateral position of the centre of pressure. It will be seen that when the taper is such that the ratio of the maximum chord to the mean chord is about 1·4 the lateral position of the centre of pressure is almost identical with that of the centre of area of the wing. It is interesting to note that most cantilever wings are designed with about this amount of taper.

For the purpose of the following investigation a parabolic plan form defined by the curve $y = kx^{\frac{1}{2}}$ will be taken, the value of k for a span of 10 units and a maximum chord of 2 units being $\frac{2}{5^{\frac{1}{2}}} = 1{\cdot}17$. The area of a wing of such a plan form is three-quarters of the area of the circumscribing rectangle. It is easily seen that the ratio of maximum to mean chord is 1·333 and that the centre of area of each half of the wing lies at a lateral distance of 0·429 of the semi-span from the fore-and-aft centre line of the wing. This point is shown plotted on Fig. 3 and falls almost exactly on the average centre of pressure position found by experiment. The aspect ratio of a wing with these proportions is $6\frac{2}{3}$.

Let us now consider the load applied normal to the wing chord on one side of the wing.

W = total weight of the aircraft less the wing weight, *i.e.*, the central load ;
A = total wing area ;
N = load factor ;
L = loading per unit area $= \frac{NW}{A}$;
l = semispan.

The plan form of the wing is defined by the curve $y = kx^{\frac{1}{2}}$ shown in Fig. 4.

The values of W, A, and L are in accordance with the size of the aircraft and the desired wing loading.

The value of k is found from the condition that when $x = l$, $y = \frac{2}{5}l$, so that $k = \frac{2}{5}\frac{l}{l^{\frac{1}{2}}}$.

$$\therefore\ k = \frac{2}{5}l^{\frac{1}{2}} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

l may now be found by integrating the plan form curve between the limits of o to l and equating to $\frac{A}{2}$.

$$k\int_0^l x^{\frac{1}{2}}dx = \frac{A}{2}$$

$$\frac{2}{5}l^{\frac{1}{2}} \cdot \frac{3}{4}l^{\frac{1}{2}} = \frac{A}{2}$$

$$\therefore\ l = \sqrt{\frac{5A}{3}} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

As we assume that the load per unit length along the wing span is proportional to the chord, the loading curve will be of similar shape to the plan form curve and is expressed by the equation :—

$$y = L\,kx^{\frac{1}{2}} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

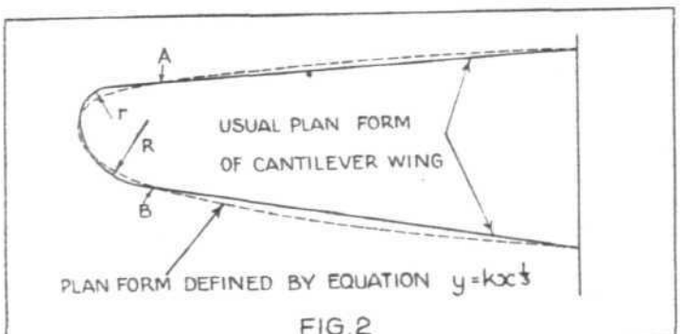


FIG. 2

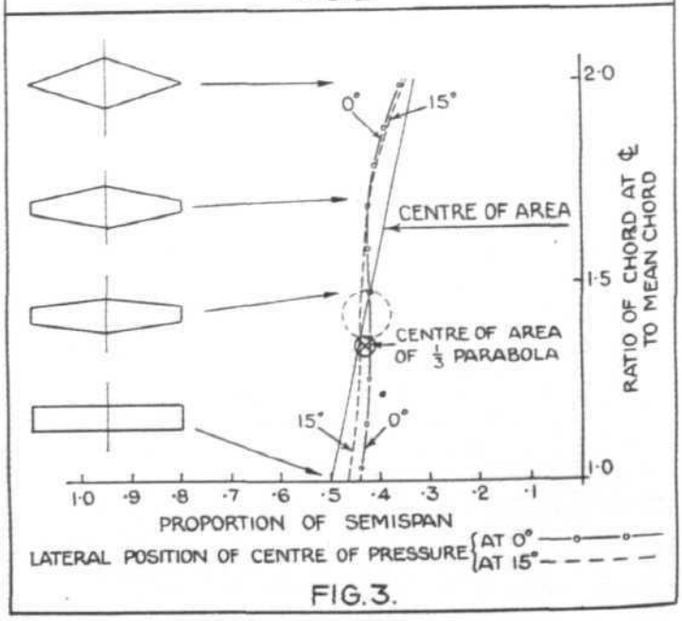


FIG. 3.

A GREAT UNDERTAKING

As makers of the widest and most successful range of British aircraft and engines the Armstrong Siddeley Development Co. Ltd. is in a unique position to offer the results of its extensive experience on matters relating to air transport, training, fighting or private flying machines on land or sea in any part of the world.

Brief details of aircraft and engines are given below. Full particulars and prices may be obtained on application.

AIRCRAFT

AIRCRAFT FOR THE SERVICES

The Armstrong Whitworth All-Steel Atlas 2-seater Fighter or reconnaissance machine, fitted with an Armstrong Siddeley Jaguar engine and either wheels or floats.

The Armstrong Whitworth All-Steel Siskin 3.A. single seater Fighter fitted with an Armstrong Siddeley Jaguar engine.

The All-Steel A.W.A. 14 high performance Fighter fitted with an Armstrong Siddeley Jaguar engine.

AIRCRAFT FOR CIVIL PURPOSES

The Armstrong Whitworth Argosy. A 20-seater Airliner fitted with three Armstrong Siddeley Jaguar engines.

The Avro Commercial Monoplanes. A 4-5 seater or 8-10 seater both fitted with three Armstrong Siddeley engines.

The Avro-Avian. A 2-seater light aeroplane fitted with Cirrus or Armstrong Siddeley Genet engine and either wheels or floats.

AIRCRAFT FOR SCHOOL & CLUB PURPOSES

The Avro Gosport, fitted with Armstrong Siddeley Mongoose engine and either wheels or floats.

The Avro 504.N. fitted with Armstrong Siddeley Lynx engine and either wheels or floats.

The Avro-Avian, fitted with Cirrus or Armstrong Siddeley Genet engine and either wheels or floats.

ENGINES

THE LEOPARD

The Armstrong Siddeley 700-750 *h.p.* 14-*cylinder Leopard* for civilian use or for carrying troops or torpedoes.

THE JAGUAR

The Armstrong Siddeley 460-500 *h.p.* 14-*cylinder Geared Jaguar* for Civil or Service requirements. Jaguar engines have been in service on the London-Paris Airway for over three years.

The Supercharged 14-*cylinder Jaguar* is specially designed for maintaining power at high altitude.

Note.—The Armstrong Siddeley Geared Centrifugal Supercharger was the first device of its kind supplied to the British Government and has now been in use for three years.

THE LYNX

The Armstrong Siddeley 230 *h.p.* 7-*cylinder Lynx* as used on the Amsterdam-Batavia, Munich-Milan and other airways.

THE MONGOOSE

The Armstrong Siddeley 130-140 *h.p.* 5-*cylinder Mongoose* engine for training work on land or sea.

THE GENET

The Armstrong Siddeley 80-88 *h.p.* 5-*cylinder Genet*, an engine which is very much lighter than any engine in its class and is, therefore, particularly suitable for powering light aircraft.

SIR W. G. ARMSTRONG WHITWORTH AIRCRAFT LIMITED.
Works & Aerodrome: Whitley, Coventry. London: 10 Old Bond Street, W.1

ARMSTRONG SIDDELEY MOTORS LIMITED.
Head Office & Works: Coventry. London: 10 Old Bond Street, W.1

A. V. ROE & COMPANY LIMITED,
Newton Heath, Manchester
and 166 Piccadilly,
London, W.1.

THE AVRO TEN

A Three Engined Commercial Monoplane

The Avro Ten is a British version of the Fokker F.VII-3m., built under licence from the Fokker Company (N. V. Nederlandsche Vliegtuigenfabriek).

It carries eight passengers and is fitted with three 230 h.p. air-cooled Armstrong Siddeley Lynx engines.

Monoplanes of this type have attained a world-wide reputation for reliability, ease of maintenance and economy of running—qualities that have been proved during a period of several years.

They are used by the principal Dutch, Swiss and Italian Airlines.

Leading Features

ENDURANCE. 4 or 6 hours according to fuel capacity at a cruising speed of 96 m.p.h. with normal full load.

CONTROL. Complete dual control with side-by-side seating for pilots. Tail trimming gear allows large variation in the position of the centre of gravity.

CABIN. Dimensions 10′ ×5′ ×6′ with seats for eight passengers. Broad windows with wide angle views. Large door and direct access by fixed step.

BAGGAGE. Three compartments, total capacity 114 cubic feet.

FUSELAGE. Tubular steel with welded joints braced with steel struts and high tensile steel wire. Covered with fabric.

UNDERCARRIAGE. Special design of simple construction providing wide track. Rubber shock absorbers with special method of adjustment.

ENGINE MOUNTING. Of simple design permitting quick removal.

TANKS. Oil tanks fitted behind engines, fuel tanks fitted in wing providing simple gravity feed. Capacity with two tanks 150 gallons. With three tanks 225 gallons.

WING. Single unit of cantilever construction. Built of wood and covered with plywood to facilitate maintenance.

A. V. ROE & COMPANY. LIMITED
MANCHESTER

THE

LYNX ENGINE

A 7 Cylinder Air-Cooled Radial

The 230 h.p. Armstrong Siddeley Lynx engine has attained a world-wide reputation for reliability and ease of maintenance.

It was with Lynx engines that Lieut. Koppen flew his Fokker F.VII-3m. from Amsterdam to Batavia and back, covering 18,000 miles in 18 days. It was with Lynx engines that Fokker machines repeated the Amsterdam-Batavia flight with equal reliability last summer, and it was with Lynx engines that the difficult Munich-Milan Italian Airline and two new Airlines in Switzerland were equipped.

Lynx engines are used in more than twenty different countries, where their independence of climatic conditions have been amply proved. They have been used with equal success in Central Africa and within the Arctic Circle.

Fitted on Avro Aircraft they are the standard training engine of the British Air Force and are widely used for seaplane training. They are also used for two-seater reconnaissance machines, single-seater fighter aircraft, deck-landing aircraft and twin-engined seaplanes.

Many of their principal parts are interchangeable with those of the Armstrong Siddeley 14-cylinder Jaguar and 5-cylinder Mongoose engines. Where different types are in service this effects great economy in the storage of spares and general maintenance.

Leading Features

7 cylinders, 5″ bore ×5.5″ stroke.
Compression ratio 5 to 1.
Normal r.p.m. 1,900. Maximum r.p.m. 2,090.
Engine weight 513 lbs.
Direction of rotation, Left Hand Tractor.

ARMSTRONG SIDDELEY MOTORS LTD.
COVENTRY

A

REMARKABLE PERFORMANCE

The Armstrong Siddeley Jaguar engines used by Imperial Airways Limited on the Argosies flying between London and Paris have set up a period of 400 hours between overhauls, the usual top overhauls having been discontinued altogether.

This achievement is claimed as a record of endurance, unsurpassed by any other engine in the world.

ARMSTRONG SIDDELEY
MOTORS LIMITED
COVENTRY

By changing the vertical scale, Fig. 4 may be made to represent the loading curve.

The expression for the shear force is found by integrating the load curve.

$$\text{Shear} = \text{L}\,k\int x^{\frac{1}{3}}dx = \frac{3}{4}\text{L}kx^{\frac{4}{3}} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (4)$$

The shape of the shear force curve is shown on Fig. 5. The expression for the bending moment is found by integrating the shear load curve.

$$\text{Bending moment, M} = \frac{3}{4}\text{L}k\int x^{\frac{4}{3}}dx = \frac{3}{4}\text{L}k\,\frac{3}{7}x^{\frac{7}{3}}$$

$$= \frac{9}{28}\text{L}kx^{\frac{7}{3}} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (5)$$

The shape of the bending-moment curve is shown on Fig. 6. The spar flange sizes, also the size of web, may now be calculated if a definite relationship between x and the spar depth be determined. The ratio of wing thickness to chord is made constant, so we may express the spar depth in terms of the chord by multiplying the chord expression, $y = kx^{\frac{1}{3}}$, by a factor c; then, if D represents the spar depth,

$$\text{D} = c\,.\,kx^{\frac{1}{3}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (6)$$

In practice c may vary between the limits of 0·1 to 0·18.

The convention will be adopted that, as the spar is deep in comparison with the thickness of the flange, the moment of resistance may be expressed as $a\text{D}f$, where a is the area of the flange and f is the maximum permissible stress in the material.

Fig. 7 illustrates the spar proportions that will be considered in the following investigation. In practice of course, the flange "a" and the web "b" would be spread in some such manner as is shown by Fig. 8, but at the present stage we are not so much concerned with details of construction as with a conventional method of finding what amount of material is required to be put into the spar to resist the bending moment.

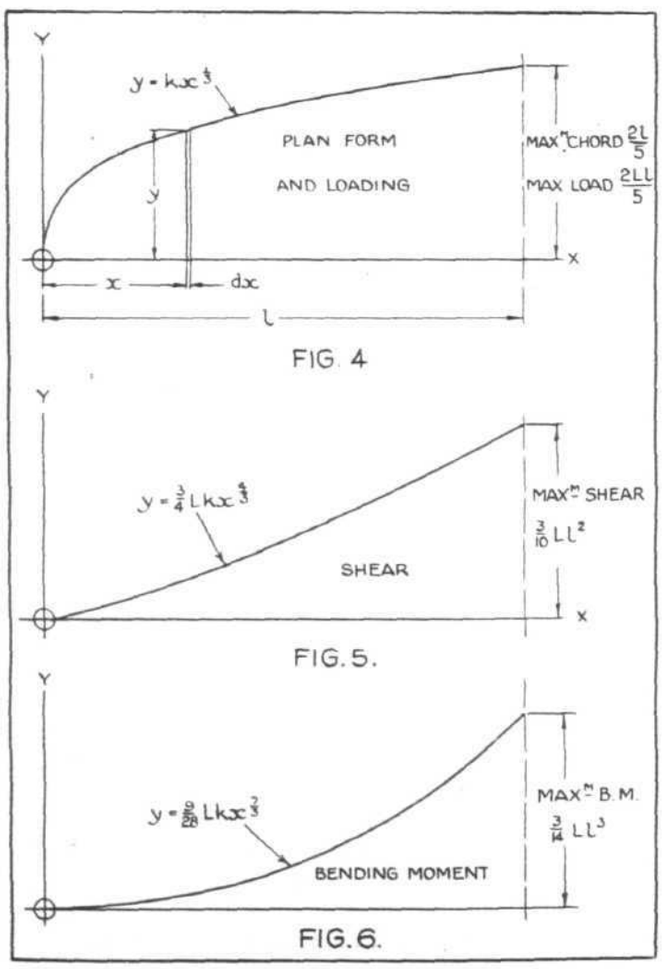


FIG. 4

FIG. 5.

FIG. 6.

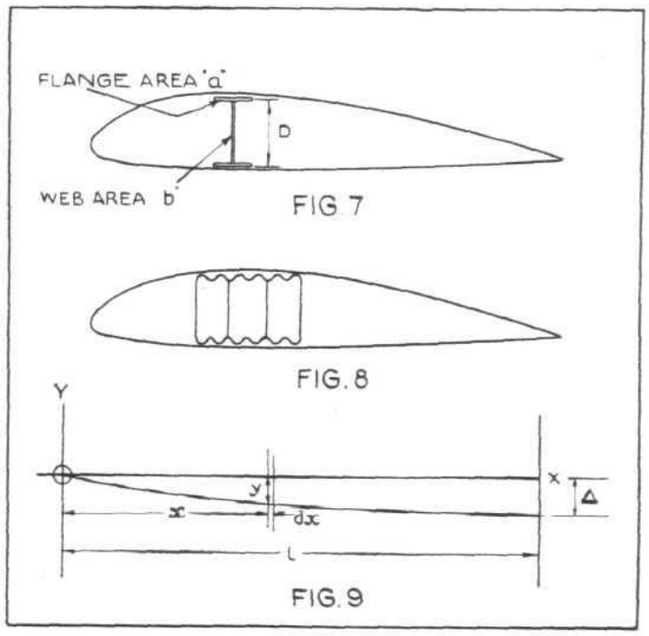


FIG 7

FIG. 8

FIG. 9

To find the flange area we have :—

Moment of resistance = Bending moment.

$$a.c.kx^{\frac{1}{3}}f = \frac{9}{28}\text{L}kx^{\frac{7}{3}}$$

$$a = \frac{9\text{L}x^2}{28c.f.} \quad \ldots\ldots\ldots\ldots\ldots \quad (7)$$

$\therefore$ for both flanges, area $= \dfrac{9}{14}\dfrac{\text{L}x^2}{c.f.}$.

The total volume of material required for the flanges from wing tip to wing root may now be found by integrating the expression for the flange area between the limits of $x = o$ to $x = l$.

$$\text{Flange volume} = \frac{9}{14}\frac{\text{L}}{c.f}\int_0^l x^2\,dx$$

$$= \frac{3}{14}\frac{\text{L}l^3}{c.f}.$$

The weight of the flanges will then be :—

$$\text{W}_a = \frac{3}{14}\rho\frac{\text{L}l^3}{c.f.} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (8)$$

where ρ is the density of the material used.

To find the web size and weight we can adopt the usual approximations applied to deep "I" girders, *i.e.* that the shear load is all taken by the web and that the shear stress is nearly uniform.

$$\text{Shear stress, } f_s = \frac{\text{Shear load}}{\text{D}t}$$

where t = the thickness of the web

$$t = \frac{\text{shear load}}{f_s\text{D}} = \frac{\frac{3}{4}\text{L}kx^{\frac{1}{3}}}{f_s ckx^{\frac{1}{3}}}$$

$$\therefore t = \frac{3\text{L}}{4f_s c}x.$$

The cross sectional area of the web, b is $t \times$ D, substituting for the values of t and D we have :—

$$b = \frac{3\text{L}x}{4f_s\text{C}} - \text{C}kx^{\frac{1}{3}}$$

$$\therefore b = \frac{3}{4}\frac{\text{L}kx^{\frac{1}{3}}}{f_s}.$$

The volume of the web is found by integrating the expression for the web area, between the limits of $x = o$ to $x = l$

$$\text{Web volume} = \frac{3}{4}\frac{\text{L}k}{f_s}\int_0^l x^{\frac{1}{3}}$$

$$= \frac{9}{28}\frac{\text{L}k}{f_s}l^{\frac{4}{3}}$$

Hence the web weight will be, $W_b = \frac{9}{28} \rho \frac{Lkl^{\frac{1}{2}}}{f_s}$.

Substituting for k :—

$$W_b = \frac{9}{70} \rho \frac{L}{f_s} l^3 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (9)$$

The formulæ (8) and (9) may now be combined to give a formula for the total spar weight.

$$\text{Total spar weight, } w = 2\left[\frac{3}{14} \rho \frac{Ll^3}{c.f.} + \frac{9}{70} \rho \frac{Ll^3}{f_s}\right]$$

$$= 2\rho L\left[\frac{3}{14c.f.} + \frac{9}{70 f_s}\right] l^3 \ldots \quad (10)$$

To find the deflection of the spar we take the origin at the wing tip as before, see Fig. 9.

In accordance with elementary beam theory $\frac{d^2y}{dx^2} = \frac{M}{EI}$

(E = modulus of elasticity of the Material and I = moment of inertia of the spar section).

Neglecting the web, I is approximately $2\left\{a\left(\frac{D}{2}\right)^2\right\} = \frac{aD^2}{2}$

I is variable and is dependent on two quantities which are functions of x. From (7) and (6) we see that a may be expressed as $k_1 x^2$ and D as $k_2 x^{\frac{1}{2}}$

$$\therefore \quad I = \frac{k_1 x^2 k_2^2 x}{2} = k_3 x^3$$

where $k_3 = \frac{k_1 k_2^2}{2}$

Similarly, from (5) the bending moment, M, may be written as $M = k_4 x^{\frac{1}{2}}$

$$\therefore \quad \frac{d^2y}{dx^2} = \frac{1}{E} \cdot \frac{k_4 x^{\frac{1}{2}}}{k_3 x^3} \qquad \text{put Q for } \frac{k_4}{k_3 E}$$

$$\text{then} \quad \frac{d^2y}{dx^2} = Q x^{-\frac{5}{2}}$$

$$\frac{dy}{dx} = \frac{3}{2} Q x^{-\frac{3}{2}} + C_1, \text{ when } x = l, \frac{dy}{dx} = o$$

$$\therefore \quad C_1 = -\frac{3}{2} Q l^{-\frac{3}{2}}$$

$$\frac{dy}{dx} = \frac{3}{2} Q x^{-\frac{3}{2}} - \frac{3}{2} Q l^{-\frac{3}{2}}$$

$$y = \frac{9}{10} Q x^{-\frac{1}{2}} - \frac{3}{2} Q l^{-\frac{3}{2}} x + C_2, \text{ when } x = o, y = o$$

$$\therefore \quad C_2 = o.$$

The wing tip deflection is the value of y when $x = l$ and is :—

$$\Delta = \frac{9}{10} Q l^{-\frac{1}{2}} - \frac{3}{2} Q l^{-\frac{1}{2}} = -\frac{3}{5} Q l^{-\frac{1}{2}} \quad \ldots\ldots\ldots\ldots\ldots \quad (10)$$

Substituting for Q :— $\Delta = -\frac{3}{5} \frac{f l^{\frac{1}{2}}}{c.k.E}$

Substituting for k, $\Delta = -\frac{3f}{cE} l \quad \ldots\ldots\ldots\ldots \quad (11)$

Examples :—

In working out specific cases it is important to retain uniformity of units, thus if we express weight in lbs. and span in feet, as is usual, we must work to stress in *lbs. per sq. foot.*

The following cases are calculated for high tensile steel as the material, the maximum permissible stress for this material being taken as 65 tons per sq. inch

Let :—

Wing loading $\frac{W}{A}$ = 12 lb. per sq. ft.

Load factor N = 10

$\therefore$ L = 120 lb. per sq. ft.

C = say 0·125

f = 21×10^6 lb. per sq. ft.

f_s = $15{\cdot}7 \times 10^6$ „ „

ρ = 500 lbs. per cu. ft.

w = Spar weight in lbs.

First let us take a small aircraft carrying a central load of 1,000 lbs.

$$A = \frac{1000}{12} = 83{\cdot}3 \text{ sq. ft., } l = \sqrt{\frac{5}{3} \times 83{\cdot}3} = 11{\cdot}78 \text{ feet.}$$

$$w = 2\rho L\left[\frac{3}{14\,c.f} + \frac{9}{70 f_s}\right] l^3$$

$$= 2 \times 500 \times 120\left[\frac{3}{14 \times {\cdot}125 \times 21 \times 10^6} + \frac{9}{70 \times 15{\cdot}7 \times 10^6}\right] l^3$$

$$= 0{\cdot}01079\, l^3$$

$$= 0{\cdot}01079 \times 11{\cdot}78^3 = \underline{17{\cdot}6 \text{ lbs.}}$$

Similarly, if the central load were to be increased to 4,000 lbs. all other conditions remaining the same as before :—

$$A = \frac{4{,}000}{12} = 333{\cdot}3 \text{ sq. ft. } l = 23{\cdot}59 \text{ ft.}$$

$$\text{Spar weight} = 0{\cdot}01079 \times 23{\cdot}59^3 = \underline{141{\cdot}5 \text{ lbs.}}$$

It must be clearly understood that the weights of spars indicated by these calculations represent the results of ideal conditions :—viz., that the design is such that no more than the exact quantity of material, necessary to resist the load, is used all along the spar and that the flange sections are so stabilised as to be able to develop the full stress of 65 tons per sq. inch in compression.

In practice it will be found impossible to fulfil these ideal conditions but as detail design improves we may get closer and closer to the theoretical design.

This method is capable of expansion in various directions and should give useful comparative data.

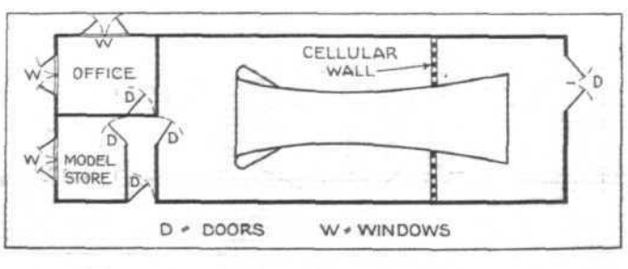
For instance for a given central load, a series of spar weights corresponding to wings of various aspect ratios could be calculated. Total weights could then be summed up from these results and a series of performance calculations would reveal the value of the aspect ratio that would give the best results.

THE ARMSTRONG-WHITWORTH WIND TUNNEL.

By R. REYNOLDS.

A wind tunnel has recently been installed at the Whitley works of Sir W. G. Armstrong Whitworth Aircraft, Ltd. As it has certain novel features which are giving very good results in practice, it is thought that a description of the tunnel and of the balances might interest the readers of THE AIRCRAFT ENGINEER.

The tunnel is generally of the type used at the National Physical Laboratory—that is to say, the working part of the tunnel is closed. The room in which it works is 72 ft. long by 20 ft. high and 20 ft. wide. The tunnel itself is 46 ft. long, and the working section is 5ft. wide by 4 ft. high.



Diagrammatic plan of lay-out of laboratory

231·36 m.p.h.

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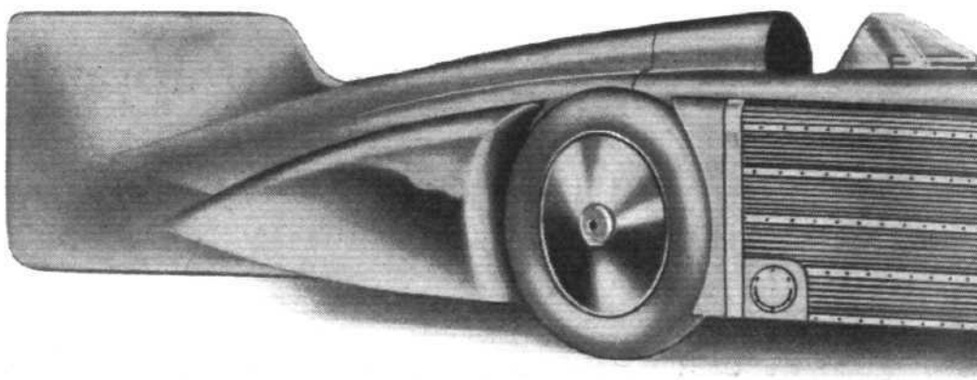
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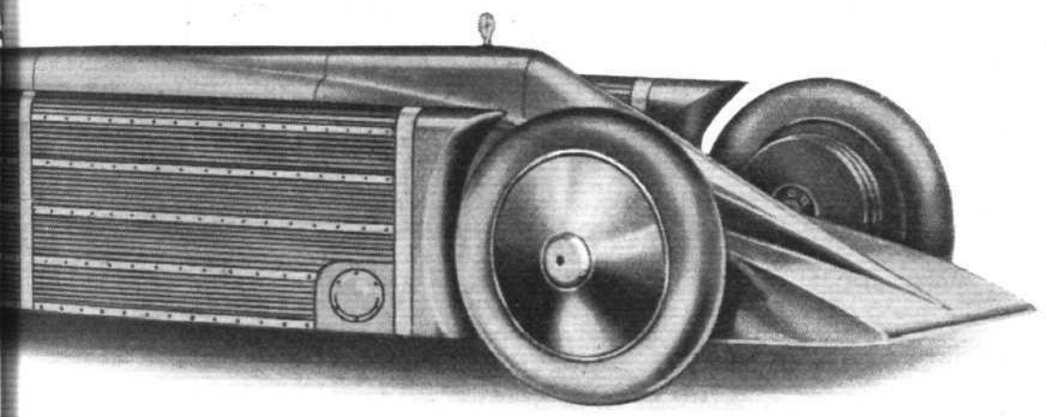
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MAJOR H. O. D. SEGRAVE.



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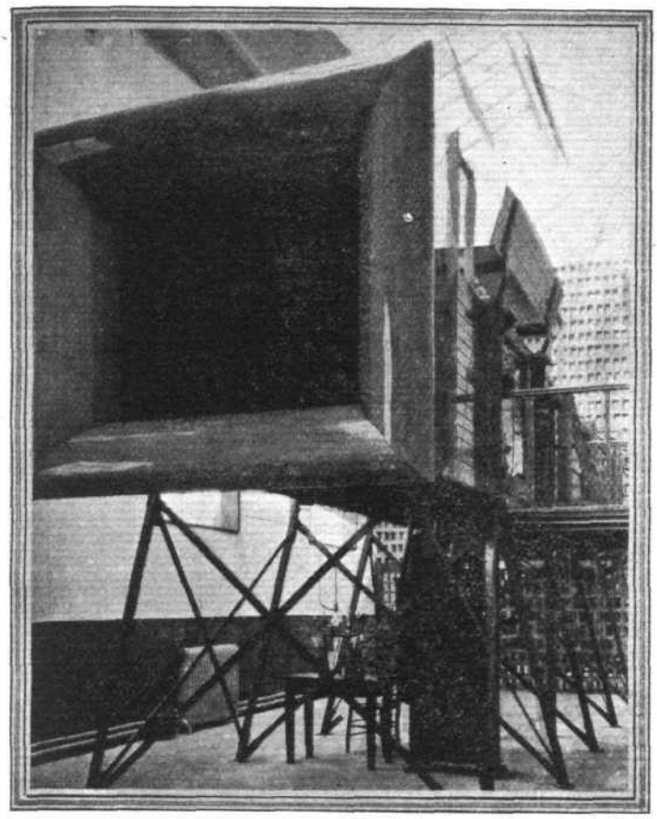
THERE is a Firth Steel for every aeronautical purpose. In addition to the honour of supplying Firth Steels for the various components of the Napier engine in the Supermarine S.5 which won the Schneider Trophy in 1927, we have also pride in the knowledge that the four Supermarine Napier Southampton flying boats which journeyed to Australia last year were even more completely equipped with Firth Special Alloy Steel engine components and flying-boat details.

We are proud in the knowledge that, in putting our best into the Special Alloy Steels used in the construction of machines which achieve such results, we are helping to further the prestige of Great Britain and her manufactures.

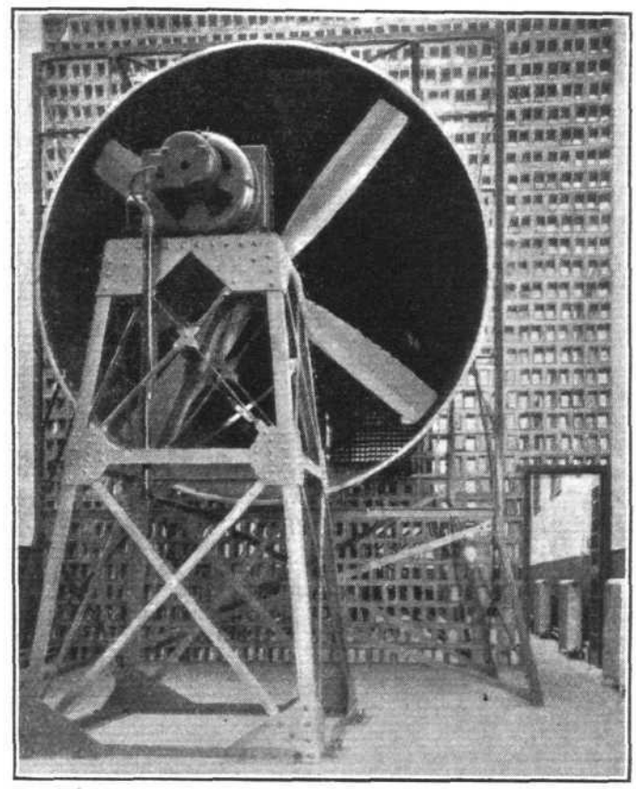
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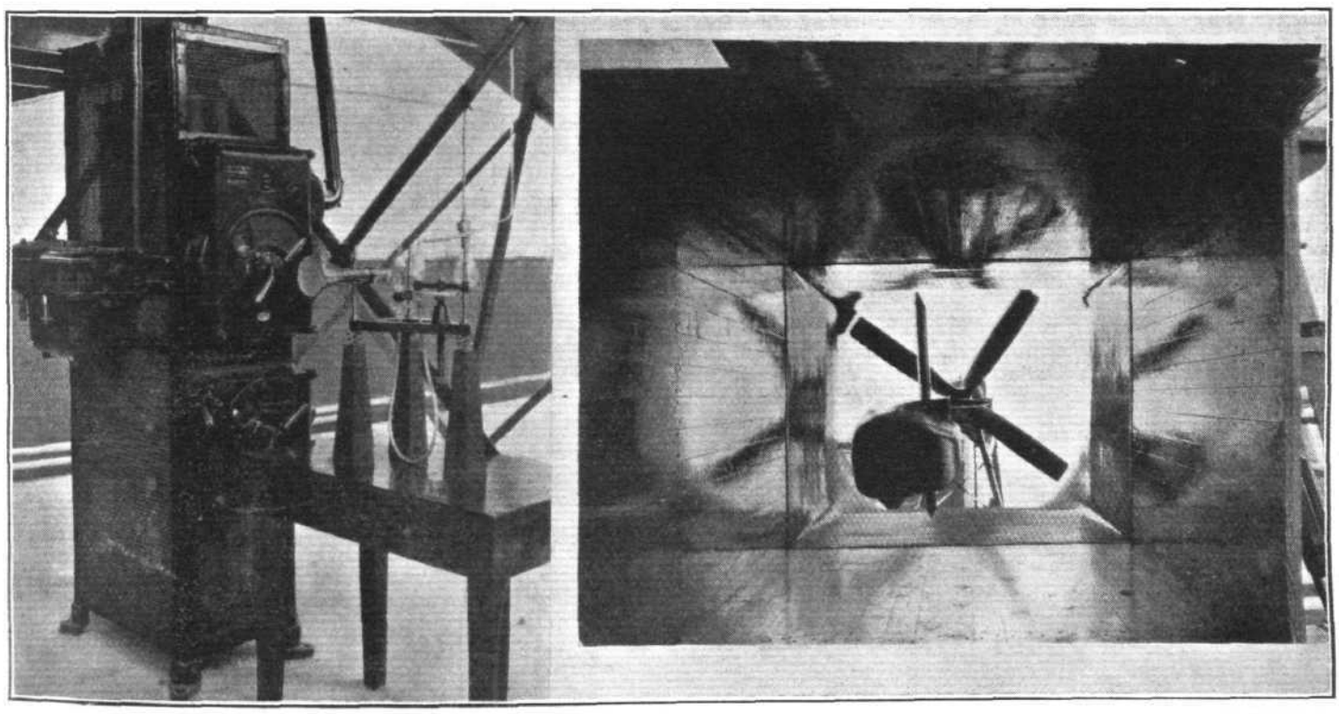
The Armstrong-Whitworth Wind Tunnel : General View.



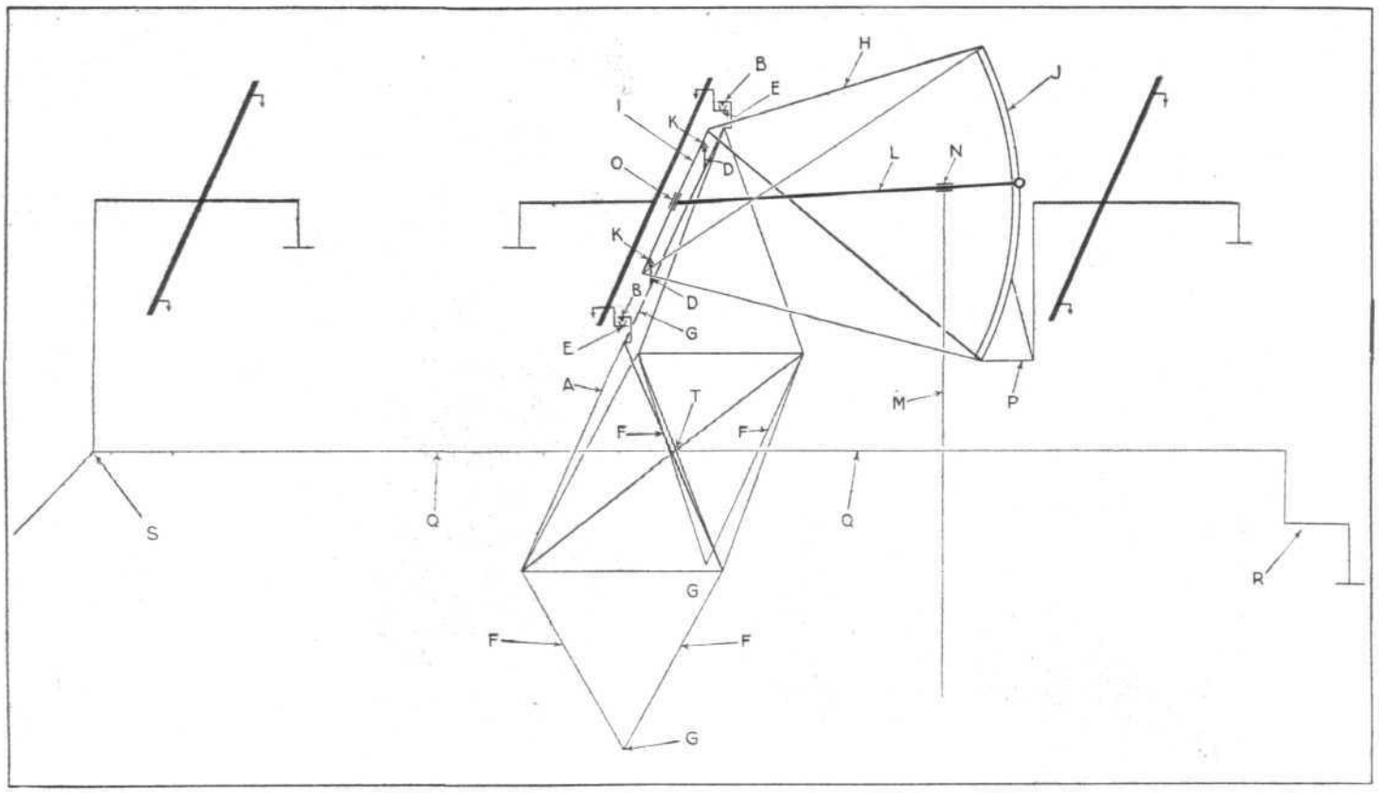
The Armstrong-Whitworth Wind Tunnel : Propeller and Motor.

The rectangular part of the tunnel is 22 ft., and the regenerative cone between the rectangular portion and the fan is 24 ft. long. The rectangular portion has a slight taper of 18 mins. and this eliminates the static pressure gradient.

The tunnel is supported by structural steel work. The working portion is made up of pitch pine. The regenerative cone is made up of three-ply wood instead of the more usual sheet steel in order to reduce drumming to a minimum. This has been particularly effective, as the tunnel can be



The Armstrong-Whitworth Wind Tunnel at Whitley : On the left are seen the motor starter and manometer, and on the right is an inside view of the tunnel itself, seen from the flare end. The door which gives access to the tunnel is seen on the extreme right.



The Armstrong-Whitworth Wind Tunnel : Diagrammatic Sketch of the Arrangement of the Balances.

run at any speed throughout its range without a trace of dithering or unpleasant noise. Particular care was taken in making the tunnel to obtain accuracy of dimensions. This was so successful that the centre line of the tunnel is within 2 mins. of the horizontal and the air flow is axial, with a maximum error of only 6 mins. This is such a small amount that no correction is needed for ordinary work.

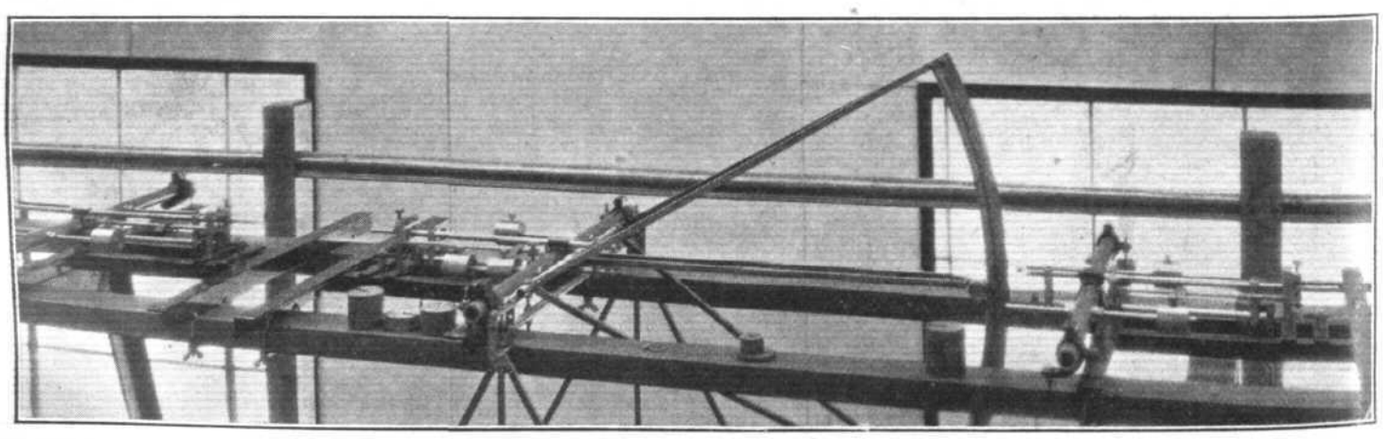
Air is induced into the tunnel by a four-bladed wooden airscrew 10 ft. in diameter, running at the maximum speed of 570 r.p.m. This is driven by an alternating-current motor of 25 h.p., which gives a maximum air speed of 75 ft. per second in the working section. Even when working at its highest speed there is so little noise that conversation can be carried on in an ordinary voice.

After the air has been exhausted from the tunnel it returns through a cellular wall made of brick which is placed 10 ft. from the airscrew. The holes in the cellular wall have a total area of one-third the cross-section of the room.

Balances.

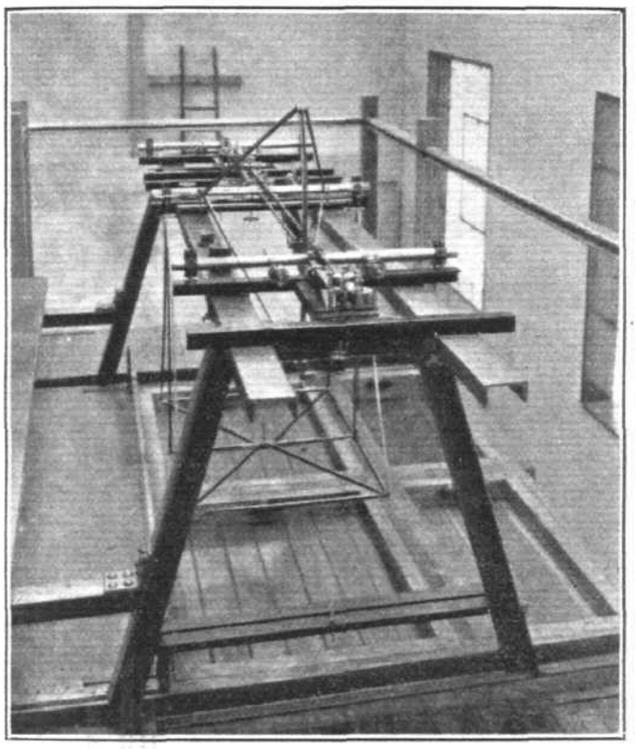
The arrangement of balances was suggested by Mr. Farren and is similar in many respects to that used at a small wind tunnel in the aeronautical laboratory of Cambridge University. The arrangement is exceedingly simple and quick to work. It is very flexible, and can be managed entirely by one operator, who has a convenient seat facing the balances so that he can take measurements in comfort. Three balances are used, and these are carried on a steel frame fitted over the top of the tunnnel at a convenient height. These three balances are identical in construction, with the exception of that used for measuring drag, which has a 1 to 1 arm. All the parts of the balances are interchangeable, and each balance can be used either right or left hand, or across the tunnel if necessary. Each balance is a steel-yard consisting of a tubular cross-member 24 ins. long at the end of which is a casting to carry the pivot supports of the balance and the main frame. Each balance has an easy means of locking, and an oil dashpot. The three balances are mounted on two 3-in. by 1-in. channel irons running parallel with the centre line of the tunnel, and 3 ft. above the roof of it. The arrangement can be seen from the photographs, and is also illustrated by a diagrammatic sketch which shows the method of support.

The main support of the model is taken from the frame A. This is built up from a very light square tubular section rolled from steel strip. This is actually a section used in



The Armstrong-Whitworth Wind Tunnel : Side View of the Balances.

the construction of steel aeroplane ribs, and makes a remarkably light and rigid structure. The frame, which is supported in the middle of the three balances, has two triangular sides, each with the apex at the top. These take pivot points B, which are connected by a tubular member C, which also carries another set ofpivot points DD. Both sides of the pivot points are exactly in line, for a reason which will become apparent later. The bottoms of the triangles are connected from corner to corner with similar framework, and the whole is made rigid by being cross-braced with wire. The frame is supported on conical caps EE at the opposite side of the casting carrying the points for the support of the balance. From the bottom corners of the frame, wires FF are taken in the same plane as the sides, forming inverted triangles. To the apex of each of these triangles GG the model is supported. The weight of the model, combined with the triangulation of the wires FF, forms a support which is virtually rigid.



The Armstrong-Whitworth Wind Tunnel : View of Balances from Propeller End.

We now come back to the pivot points DD which are placed on the tubular member connecting the two triangular sides of the main frame. These carry the auxiliary frame H for supporting the tail of the model in such a way that the angle of incidence can be adjusted without interfering with any part of the balance or suspension. This frame has two triangular sides, the apex of which is joined by a tubular member I. The bases of each are connected to a graduated arc J.

From the centre point of the auxiliary frame is carried an arm L which can be moved about the graduated arc J and locked in any desired position on it. It is from this frame that the tail of the model is carried by a vertical wire which can be adjusted by sliding the bracket N along the arm. It should be noted particularly that the point O, where the arm is attached to the cross-member of the auxiliary frame I, is placed on a vertical line going through the pivot points on the tubular member of the main frame. This is to ensure a parallel motion between the model and the arm on the auxiliary frame. The reason for this is because the suspensions at both ends of the model remain vertical, and consequently parallel to each other when the swinging arm N is altered to adjust the incidence of the model.

At the bottom of the graduated arc there is a small bracket P which carries a vertical wire to the balance immediately above it. Lift forces are thus transmitted to the vertical balances carrying the main and auxiliary frames, the lift of the tail of the model being distributed between the two balances.

In order to measure the drag of the model a horizontal wire Q is fastened to the bottom of the main frame. On the down-wind side is a counterpoise R and on the up-wind side an attachment is made at S to a wire at 45° to the horizontal fastened to the roof of the tunnel, and also direct vertically to the drag balance. The attachment of this wire to the main frame is arranged with a release at T so as to ensure that the main frame can always be locked into position with its centre line vertical. It has already been explained that all the pivot points on the tubular member of the frame are in line, and therefore any rocking motion of the main frame due to drag is not transmitted to the auxiliary frame. In the same way, any movement of the auxiliary frame due to lift is not transmitted to the main frame.

The National Physical Laboratory duplex type of manometer is used for measuring air speed. This consists of two glass limbs, one of which has an inner tube with its end nearly midway between the top and bottom of the outer jacket. This is not joined to the inner tube, but serves as a jacket for oil. The two glass limbs are joined with a rubber tube, and are filled with distilled water, which comes in contact with oil in the jacketed limb and forms a miniscus. A simple optical arrangement projects the miniscus on to a screen, where it can be adjusted to a hair line. The other limb of the manometer can be raised or lowered by a fine pitch screw fitted with a micrometer. This type of manometer has many advantages. In the first place, the zero can be set by three different methods ; either by the adjustment of an indicator on the screw thread ; or by moving the optical arrangement up and down ; or by moving the limb which forms the miniscus. Secondly, the cleaning of the gauge is very easy, and it can be carried out without fear of damaging the glass work.

Communicating with the tunnel is a well-equipped office and a model store, and the whole is arranged so that fresh air can be drawn into the building by opening the windows of the model store and the door at the propeller end of the building, and using the tunnel as a suction plant.

TECHNICAL LITERATURE

SUMMARIES OF AERONAUTICAL RESEARCH COMMITTEE REPORTS

These Reports are published by His Majesty's Stationery Office, London, and may be purchased directly from H.M. Stationery Office at the following addresses : Adastral House, Kingsway, W.C. 2 ; 28, Abingdon Street, London, S.W.1 ; York Street, Manchester ; 1, St. Andrew's Crescent, Cardiff ; or 120, George Street, Edinburgh ; or through any bookseller.

Wind Tunnel Experiments on a Model Autogyro at Small Angles of Incidence. By C. N. H. Lock, M.A., and H. C. H. Townend, B.Sc. R. & M. No. 1154 (Ae. 319) (61 pages and 23 diagrams). March, 1928. Price 2s. 6d. net.

When the first reports of the autogyro appeared in this country (in 1925), the only experimental data available on a screw of low pitch were those contained in R. & M. 885, " Some experiments on airscrews at zero torque," and in R. & M. 1014, " An extension of the Vortex Theory of airscrews : Applications to airscrews of low pitch with experimental results."

The experiments in these reports related to a two-bladed screw of 3 ft. diameter with its plane of rotation normal to the wind direction. Some preliminary experiments on this screw with its axis inclined to the wind did not give satisfactory results, and consequently it was decided to construct and test a large model which might be expected to behave like an autogyro, whereas there was considerable difficulty in getting the smaller model to rotate freely as a windmill.

A wooden scale model, 6 ft. in diameter, of the original four-bladed rotating wing unit of the Cierva Autogyro has been tested in the Duplex tunnel at blade angles of 0°, 1°, 1·8°, 2·3°, and 3°. It has also been tested as a two-blader at a blade angle of 1·8°. The extreme range of incidence was from

2° to 20°, and of rotational speed from 3 to 12 revolutions per second. It was found that the model would not rotate at all at a blade angle of 4°, while at 3° blade angle it would only rotate at angles of incidence above 12°. In order to supplement the measurement of forces and rotational speed at zero torque, observations of forces and angular accelerations were made over a more limited range at varying rotational speed, by means of a chronograph and stroboscope. These observations were interpreted as giving the forces and torque in steady motion when the torque was not zero. Observations were also made of the angular motion of the blades in flapping about their hinges.

The greatest value of lift/drag ratio was observed on the screw with blade angle 1·8° at an incidence of 3°; this value, subject to considerable uncertainty on account of the large correction for drag of the boss, was 7·5 for the four-blader and 8·0 for the two-blader at 4° incidence. The scale effect was appreciable on lift coefficient at all angles of incidence, but on other coefficients it was small except at the smallest incidence.

The comparison between two- and four-blader was in good agreement with the simple Prandtl theory of interference given in R. & M. 1111,* so that the results should apply to an autogyro of any intermediate solidity. The torque curves derived from the observations of angular acceleration confirm the remaining observations in showing that the results vary critically with change of blade angle. The observed flapping motion is in good qualitative agreement with theory, the second and higher harmonics being negligible on account of the high density of the model blades.

* R. & M. 1111. "A General Theory of the Autogyro."—H. Glauert.

ON THE CONVECTION OF HEAT FROM THE SURFACE OF AN AEROFOIL IN A WIND CURRENT. By L. W. Bryant, B.Sc., A.R.C.Sc., E. Ower, B.Sc., A.C.G.I., A. S. Halliday, B.Sc., D.I.C., and V. M. Falkner, B.Sc. R. & M. No. 1163. (Ae. 327). May, 1928. (24 pages and 37 diagrams). Price 1*s.* 3*d.* net.

Although considerable construction difficulties are encountered in the installation of wing radiators, their attractiveness from the point of view of saving head resistance seems likely to render them an indispensable feature of the fastest aeroplanes for some time to come. A research on the cooling of a wing surface in a wind tunnel was begun in 1925 with a view to providing information which would be of value to the designer of wing radiators. The results obtained are believed to be sufficient to form a reliable guide to the relative effectiveness as cooling agents of the different parts of the wing section at various incidences over the normal flying range. Comparisons are made with results of tests made at the R.A.E. on the overall cooling of a R.A.F. 30 wing radiator, and of a new type of radiator which uses the front portion only of the wing surface. The agreement between the N.P.L. and R.A.E. results is considered to be reasonably good in view of the fact that the wing sections were not the same.

A model of R.A.F. 26 section was covered with platinum strips over a span of 8 in., the strips being heated by passing a current through each until all strips were at a uniform temperature, as measured by their resistances. The input, measured electrically, gave the heat dissipated by the wind. Tests were made at incidences from −2·5° to 12·6°, and at wind speeds from 32 to 75 ft./sec.

Supplementary measurements were made on a suitable duplicate wing of pressure distribution around the section, and also of total head behind the model.

The rate of cooling is a maximum at the leading edge: it then drops very rapidly on the upper surface to a minimum at incidences above 2°, rising to a second maximum which recedes towards the trailing edge as incidence increases, finally disappearing at the stall. The cooling of the lower surfaces does not appear to vary appreciably with change of incidence except below 0°.

It would appear that the skin friction near the leading edge is greater than anywhere else on the surface, according to Prof. Bairstow's theoretical investigations, and this explains the intense cooling at the nose. It seems likely also that the skin friction along the under surface is independent of incidence since the velocity along it is always approximately that of the free stream.

A test of the heat communicated to the air in the wake gave good agreement with the heat lost by the strips, and it was concluded that all the heat was confined to the air which had lost energy as measured by total head.

THE EFFECT OF WIND, WEIGHT AND ATMOSPHERIC CONDITIONS (INCLUDING SEMI-TROPICAL CONDITIONS) ON THE DISTANCE TO TAKE-OFF AND LAND AN AIRCRAFT. By Flight-Sergt. B. H. Rolles and H. L. Stevens, B.A. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1172. (Ae. 336). (14 pages and 7 diagrams). May, 1928. Price 9*d.* net.

The distance to take-off of an aircraft has been previously examined* and in the present report, the effect of atmospheric changes on the take-off run, as in India and the Middle East, consistent with aerodromes of high altitude or under semi-tropical conditions has been calculated.

In Part I, atmospheric effects are calculated for a troop carrier and a high performance two-seater, the altitude ranging from 0 to 6,000 ft. and temperature variation from 0° C. to + 45° C. The wind effect has also been taken into consideration and a semi-graphical method evolved for correcting measured take-off runs to the condition of "no wind."

In Part II, simplified correction factors are obtained for small changes in weight, wind and atmospheric conditions, and the calculations have been extended to include landing runs.

In Part III, full scale tests with weight variations up to 62 per cent. and in winds up to 17 per cent. of the take-off speed in a calm have been compared with theoretical predictions using the simple formulæ of Part II.

At a given altitude the take-off run is directly proportional to the absolute temperature, that is an increase in temperature from +15° C. to +45° C. increases the run by 10·5 per cent. If, however, the engine power under hot conditions were a function of density instead of pressure only, this figure would be increased to 20 per cent. An increase in altitude from 0 to 5,000 ft. at a temperature of 15° C. increases the run approximately 60 per cent. A head wind of 10 m.p.h. with normal loadings, reduces the run by about 30 per cent.

Unless the aeroplane is fairly near the limit for a reasonable take-off, the correction factors are not appreciably affected by aeroplane characteristics. Comparison of the full scale and theoretically predicted results over the ranges of weight and wind variation experienced in the practical tests shows good agreement. Further, a comparison is made with some full scale tests contained in American N.A.C.A Technical Note 257.†

* R. & M. 680. "The distance required to take-off an aeroplane," by R. McKinnon Wood and F. B. Bradfield, of the Royal Aircraft Establishment.

† Technical Preparation of the Aeroplane "Spirit of St. Louis."

PHOTOGRAPHS OF STREAMERS ILLUSTRATING THE FLOW AROUND AN AIRSCREW IN THE VORTEX RING STATE. By C. N. H. Lock, M.A. R. & M. No. 1167 (Ae. 331). (4 pages and 13 diagrams). April, 1928. Price 1*s.* net.

The work described in this report is at present mainly of a theoretical interest, as it is unlikely that airscrews will be designed which will be working under conditions of a negative thrust (except perhaps for airships). The work may, however, have application later to the Vortex Theory of Airscrews, and so help in the prediction of results under more normal conditions.

A previous attempt to photograph the flow around a model screw of 1-in. diameter in a water channel is described in R. & M. 1043.* From the result of these experiments, it was anticipated that the flow in the wind tunnel under these conditions would prove highly turbulent, and a preliminary exploration was accordingly made by means of streamers. A 3-ft. airscrew was set to run at a constant speed of 18 revolutions per second, and pieces of cotton wool on the end of threads were used to indicate the direction of the flow. The photographs illustrating the report, show the flow past the airscrew when in the normal state of running, the flow when running under static conditions, and the flow when in the windmill brake vortex state.

* R. & M. 1043. Photographs of the Flow round a model Screw working in water, especially in the "Vortex Ring State."—C. N. H. Lock and H. C. H. Townend.

THE BOUNDARY LAYER OF THE FRONT PORTION OF A CYLINDER. By A. Thom. B.Sc., Ph.D. Communicated by Professor J. D. Cormack. R. & M. No. 1176 (Ae. 340) (20 pages and 7 diagrams). July, 1928. Price 1*s.* net.

A large amount of information is now available regarding the flow of water or air past a cylinder placed across the stream, so far as the behaviour of the main body of the fluid is concerned; but the conditions in the layer close to the surface of the cylinder seem to be largely unknown. Accordingly it seemed advisable to explore the velocity, etc., close to the surface. This paper consists of two parts, first, a description of experiments on the boundary layer carried out in the summer of 1927 in the James Watt Engineering Laboratories, University of Glasgow, and, secondly, a theory of the boundary layer over the front portion of the cylinder based on Prandtl's simplified boundary layer equations.

The experiments were made on a brass cylinder 4·5 in. in diameter, which extended across the 2-ft. square tunnel, at speeds of 12·3 and 36 ft./sec.

Good agreement was obtained between the calculated and measured distribution of velocity, and with some N.P.L. experiments (R. & M. 1179—T 2644).

THE INCLUSION OF PARTIAL GLIDES IN ROUTINE PERFORMANCE TESTS. By A. E. Woodward Nutt, B.A. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1180 (Ae. 344). (3 pages and 2 diagrams.) May, 1928. Price 4*d.* net.

A request was received to investigate the desirability of carrying out partial glides in addition to partial climbs on aircraft submitted for type trials at Martlesham Heath, in order to obtain information at values of V/nD higher than those given by the partial climbs, and with a view to the possible determination of the best gliding angle of the aircraft.

Sets of partial glides with the engine shut off or throttled down have been carried out on a number of aircraft over a wide range of speed, and the results plotted in conjunction with those of the partial climbs carried out on these aircraft during their type trials.

Valuable additional information at high values of V/nD is given by these tests, and a check provided on the theoretical extrapolation of the curves of $V_c\sqrt{\sigma}$ against V/nD for level flight. An indication of the best gliding angle of an aircraft can be obtained if required.

As a result of this and other work, partial glides are now carried out as a routine test on all aircraft sent to Martlesham Heath for complete type trials.

ON THE USE OF A FOLLOW-UP MECHANISM IN AERODYNAMIC SERVO-CONTROL SYSTEMS H. M. Garner, M.A., and K. V. Wright, B.A. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1187. (Ae. 349) (8 pages and 2 diagrams). May, 1928. Price 6*d.* net.

Up to the present servo rudders have been fitted with an arbitrary amount of "follow-up" and it appeared desirable to investigate the properties of servo control systems fitted with different amounts of follow-up. Some wind tunnel tests of these controls have been described in R. & M. 1186.*

The analysis applies to the flap type servo control whose aerodynamic properties were investigated in R. & M. 1105.† The effects of follow-up on the "efficiency" of the system (as defined in that report) and on the stability of the aeroplane are determined (1) when no additional force is applied to the servo control, (2) when a spring force proportional to its angular displacement is applied.

The effect of follow-up is to increase the "efficiency" of the system, because the pilot does part of the work of moving over the control and so less power is lost by the servo, but the analysis indicates that larger amounts of follow-up than those in use at present would require to be provided. The stability with no follow-up, when the control is fixed by the pilot, is the same as the stability with ordinary controls free. The introduction of follow-up brings the stability nearer to that with controls fixed, and is therefore advantageous.

It is suggested in the report that full scale experiments on a twin-engined aeroplane fitted with servo rudders be made to test the effect of various amounts of follow-up.

* R. & M. 1186. Wind tunnel tests of various servo rudder systems.—K. V. Wright, B.A.

† R. & M. 1105. The aerodynamics of a simple servo rudder system. H. M Garner, M.A. and C. E. W. Lockyer, B. A.

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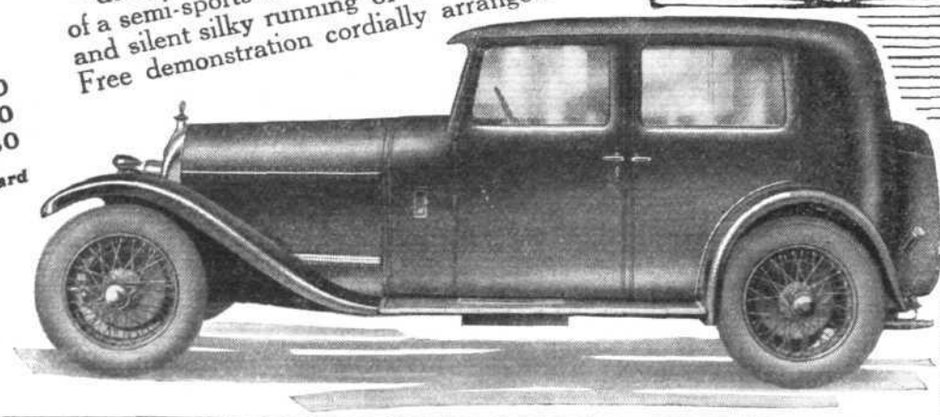
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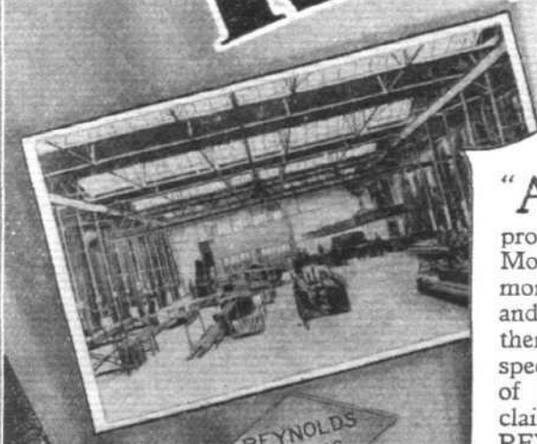
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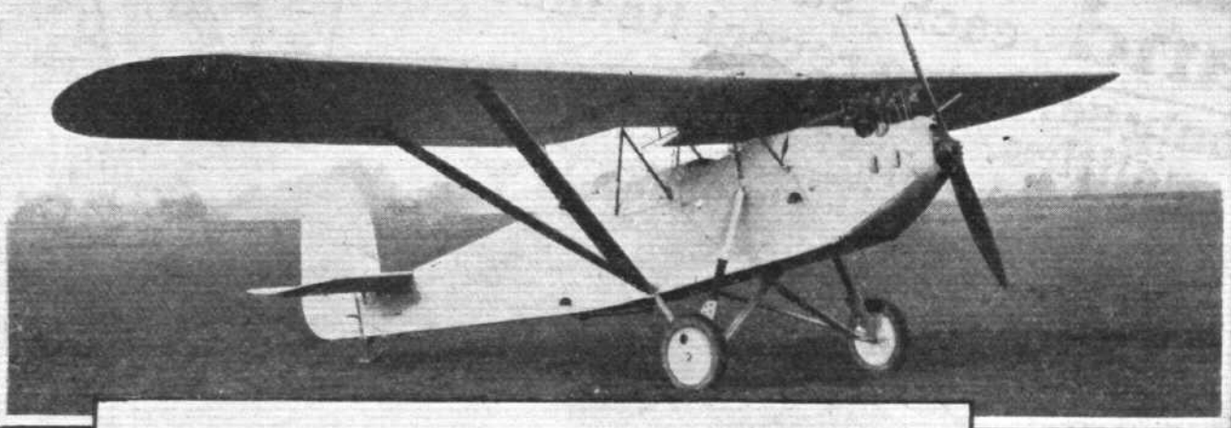
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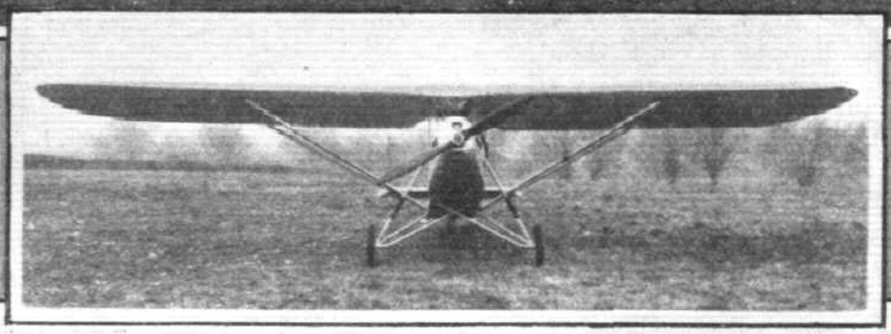
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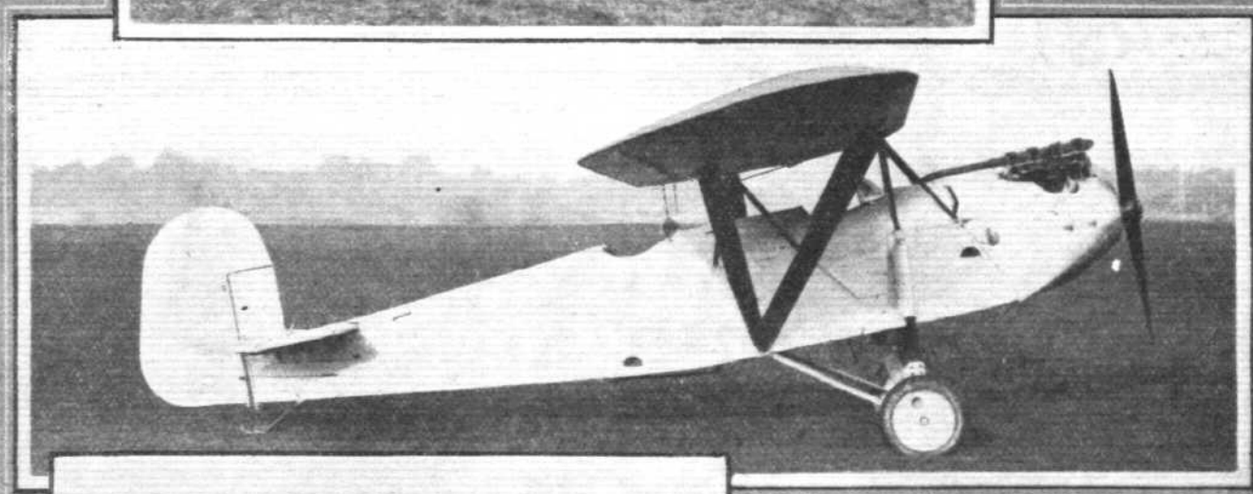
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Mr. Scott-Taggart's Cross-Country Flight





Mr. John Scott-Taggart (left) welcomed by Capt. Strub, Provincial President of the Swiss Aero Club, on his arrival at Lausanne from Stag Lane in his Gipsy-Moth. This was his first cross-country solo-flight.

Commander Deacon, late R.N., officer-in-charge of Lympne, who watches over carefully the Channel departures of light 'plane tourists.

AFTER a few hours' solo experience, Mr. Scott-Taggart, the private owner of a Gipsy-Moth, elected to fly to Lausanne, from London, on his first cross-country flight. He reached there safely, recently, and in a letter to FLIGHT he recommends Switzerland to those who seek an ideal flying climate. The only trouble in flying to Lausanne, he remarks, is that in the event of a forced landing, Lake Geneva would seem to be the safest place. His route from Stag Lane took him first to Lympne, where Customs were passed and fuel taken in, then right across country to the east of Paris to Chatillon, where more fuel was obtained, then proceeding to Dijon, and thus turning east for Lausanne. The alternative route, he suggests, is *via* Paris, Lyons and Geneva, but it is longer. On his course, he was off the straight track from Paris to Dijon, but he was able then to circle the big military aerodrome at Romilly and alight at the excellent landing ground at Chatillon, where there is a light-house, but no hangars. The name of each ground is marked in a circle.

Only one machine per month seems to visit Chatillon, whilst flights from Paris to Lausanne are rare. He states that a direct course from Dijon is not easy to follow from Paris, so he recommends the alternative route which he took. At Chatillon, he refuelled his machine as a precautionary measure in the event of his failure to find Dijon, for then it would have meant a bad landing somewhere in very poor visibility. Between Dijon and Lausanne, he crossed the mountains at 10,000 ft. Had a forced landing been imperative, he was hoping to find a forest or a snow-covered slope as offering less landing shock.

Mr. Scott-Taggart is a member of the London Aeroplane Club.

HOW TO QUALIFY FOR A MASTER PILOT'S CERTIFICATE

Raising the Pilot's Status

WE would draw attention to the Air Navigation Directions (A.N.D.7A) which have just been issued by the Air Ministry. They give particulars of qualifications necessary to obtain the Master Pilot's certificate. The certificates will be issued to suitable applicants with experience on land machines or marine aircraft. They must be holders of a current "B" licence, must have held such a licence for at least five years, and during that period they must have flown at least 1,000 hours as a pilot. Flying experience must include 200 flying hours on either single-engined machines, of at least 300 h.p., or on multi-engined aircraft. Of that 200 hours, at least 100 must have been spent on multi-engined aircraft. Now if the applicant desires his master pilot's certificate for land aircraft he must have had the whole 200 hours' experience on land aircraft, or if he requires the certificate for marine aircraft, then he must have flown the 200 hours on marine aircraft.

Another necessary condition is twenty cross-country or oversea flights, each of a minimum duration of one hour, commenced and completed during the night. A current second-class or first-class licence to navigate aircraft must also be possessed.

But the Secretary of State will accept qualifications different from the above if they appear to be of equivalent substantiality. Once obtained, the master pilot's certificate will not require renewing. This new elevation of the pilot's status comes into operation on April 1 next. Application should be made to the Secretary (D.C.A.), Air Ministry, London, W.C.2.

There should be many pilots who are already qualified for this new certificate, such as Imperial Airways pilots, club instructors and air-taxi pilots. No doubt there are also many pilots with the necessary flying time, but without either navigator's certificate. There are only three airmen in this country who have qualified for the first-class navigator's certificate. They are Capt. F. Tymms, M.C., of the

Air Ministry, Sqdr. Ldr. E. L. Johnston, O.B.E., A.F.C., of the Royal Airship Works, Cardington, and Flying Officer F. W. M. Downer, who was the navigator to Capt. F. Courtney on his first abortive attempt to fly the Atlantic in the Dornier "Whale" in 1927. Thirty-one pilots hold the second-class certificate, including most of the Imperial Airways pilots. Capt. W. L. Hope, the air-taxi pilot, also holds one. Incidentally, this certificate is not necessary for obtaining the "B" licence, as many think. There *is* a technical examination in navigation when qualifying for that licence, but it is not so stiff as the higher examinations.

There is now a Guild of Air Pilots and Air Navigators. At their meeting at the Royal Aero Club on February 13 with Sir Sefton Brancker in the chair, and a committee composed of Capt. N. MacMillan, Capt. Wilcockson, Sqd. Ldr. E. L. Johnston, Lieut.-Col. G. L. P. Henderson, Capt. V. H. Baker, Capt. W. L. Hope, Maj. H. G. Brackley and Mr. Lawrence Wingfield, it was resolved to limit the membership to 500, inclusive of Dominion members, for the purpose of registering the Guild, but with provision for powers to increase the membership from time to time. They held another meeting at the Royal Aero Club on March 12 to read and approve the "Draft Memorandum of the Association," and prepare "Articles of Association." Communications on this subject should be sent to Sqdr. Ldr. E. L. Johnston, Royal Airship Works, Bedford.

LIGHT 'PLANE CLUBS

London Aeroplane Club, Stag Lane, Edgware, Sec., H. E. Perrin, 3, Clifford Street, London, W.1.

Bristol and Wessex Aeroplane Club, Filton, Gloucester. Secretary, Major G. S. Cooper, The Aerodrome, Patchway, Glos.

Cinque Ports Flying Club, Lympne, Hythe. Hon. Secretary, R. Dallas Brett, 114, High Street, Hythe, Kent.

Hampshire Aero Club, Hamble, Southampton. Secretary, H. J. Harrington, Hamble, Southampton.

Lancashire Aero Club, Woodford, Lancs. Secretary, Mr. Atherton, Avro Aerodrome, Woodford.

Liverpool and District Aero Club, Hooton, Cheshire. Hon. Secretary, Capt. Ellis, Hooton Aerodrome.

Midland Aero Club, Castle Bromwich, Birmingham. Secretary, Maj. Gilbert Dennison, 22, Villa Road, Handsworth, Birmingham.

Newcastle-on-Tyne Aero Club, Cramlington, Northumberland. Secretary, J. T. Dodds, Cramlington Aerodrome, Northumberland.

Norfolk and Norwich Aero Club, Mousehold, Norwich. Secretary, G. McEwen, The Aerodrome, Mousehold, Norwich.

Nottingham Aero Club, Hucknall, Nottingham. Hon. Secretary, Cecil R. Sands, A.C.A., 30, Park Row, Nottingham.

The Scottish Flying Club, 101, St. Vincent Street, Glasgow. Secretary, George Baldwin, Moorpark Aerodrome, Renfrew.

Southern Aero Club, Shoreham, Sussex. Secretary, Miss N. B. Birkett, Shoreham Aerodrome, Sussex.

Suffolk Aeroplane Club, Ipswich. Secretary, Maj. P. L. Holmes, The Aerodrome, Hadleigh, Suffolk.

Yorkshire Aeroplane Club, Sherburn-in-Elmet, Yorks. Secretary, Lieut.-Col. Walker, The Aerodrome, Sherburn-in-Elmet.

LONDON AEROPLANE CLUB

(MAR. 18–24).—Total flying time, 57 hrs. 20 mins. Dual instruction.—39 members received dual instruction during the week, the time being 31 hrs. 30 mins. Solo flying—31 Members flew solo during the week, the time being 25 hrs. 50 mins.

During the week W. B. Swart and E. Davis both made their first solo flights.

Easter Holidays.—The club will remain open during the Easter holidays, including Easter Monday. The club will close down for the day on Wednesday, April 3.

Clubhouse Fund.—H. J. Bacon, £1 1s.

BRISTOL & WESSEX AEROPLANE CLUB, LTD.

(MAR. 17–23).—Pilot instructor: E. B. W. Bartlett. Ground engineer: A. W. Webb. Machines in commission: (2), TV and YH. Flying time for the week: 23 hrs. 50 mins. Pupils under instruction: 12 hrs. 40 mins. Soloists under instruction: 2 hrs. 15 mins. "A" pilots flying: (6), 8 hrs. 5 mins. Passengers carried: (8), 1 hr. 25 mins. Test flights: (12), 1 hr. 10 mins.

The Filton "season" has definitely commenced, and every week-end brings more members to the club house. A very gratifying and regular application for membership has marked the improved weather, and we welcome several "A" pilots to the club. Mr. Wells working for his "B," flew to Stag Lane and back. Mr. Keeling successfully passed his height test for "A." We have been interested watching a "gamecock" test for a new duralumin propeller on a Bristol "Jupiter" engine, which has been carried out by our friends the Bristol Co. Maj. E. Cadbury, D.S.C., D.F.C., whose war achievements all will remember, pleased everyone by taking the air again this week, and as one would expect, was at home at once after not having flown for over 10 years. We hope he will be an early "A" member. Several parties have already been arranged for our dance on April 19, which promises to be a great success. The club is closing from the 25th to 29th inclusive, for Easter, but will be open for flying from the 30th as usual, includ ng Easter Monday. Members will receive the programme for the year very shortly.

HAMPSHIRE AEROPLANE CLUB

(MAR. 16–22).—Pilot instructors: Flight-Lieut. F. A. Swoffer, M.B.E., and Mr. W. H. Dudley. Ground engineers: Mr. E. Lenny and Mr. J. Elliott. Aircraft: D.H. 60 "Moth" G-EBOI, and Avro "Avian" G-EBVI. Flying time for the week: 35 hrs. 40 mins. Pupils under instruction: (20), 15 hrs. 55 mins. Soloists: (4), 2 hrs. 35 mins. "A" Pilots: (14), 11 hrs. 20 mins. Passengers: (13), 3 hrs. 15 mins. Instructors: solo and tests (11), 2 hrs. 35 mins.

Alas and alack, we have but one machine again. Referring to our remarks a fortnight ago, the Chief Instructir's nerves have proved stronger than the undercarriage. Neither had any particular strain placed upon them, but the latter has apparently not completely recovered from its old habit of giving way unexpectedly. Unfortunately, this shortage of aircraft will preclude our attending the meetings at Lympne and Conington at Easter. We are obtaining a fourth aeroplane and delivery of this is expected towards the end of April.

At the invitation of the Club, Lady Bailey broadcast from Bournemouth on Tuesday last. A few days earlier, Miss A. B. Grace, our first "ab initio" licensed lady pilot broadcast from the same station, and already a number of enquiries as to how to join the club have been made by people interested. This should give a fillip to our Bournemouth section.

The club will be open over the Easter holidays, and in consequence, will be closed on Monday and Tuesday of the following week, April 8 and 9.

LIVERPOOL & DISTRICT AERO CLUB

(MAR. 17–23).—Total flying time, 23 hrs. 25 mins; 18 pupils totalled 16 hrs.—in dual; 3 pupils totalled 1 hr. 35 min. solo; 8 "A" pilots totalled 2 hrs. 55 mins. solo; 6 passenger flights totalled 2 hrs. 35 mins.; 8 test flights totalled 40 mins.

Easter Holidays.—Flying will continue throughout the Easter week-end. There will be no staff holiday on Easter Monday. The club will close down on Sunday evening, April 7, and reopen for flying on Thursday morning April 11. Club members can thus spend Easter in the air, and it is hoped will take full advantage of the opportunity.

Club scarves and ties can now be obtained from the secretary.

Several visitors have called this week, en route for Aintree, and "The National" Mr. and Mrs. Naylor, flew over daily (2 hrs. by road, 10 mins. by air).

On Saturday we had a five miles visibility. One felt thoroughly unsafe flying in such apparently thin atmosphere.

The writer craves the Bristol Club's forgiveness for his remarks re the efficiency of the Liverpool Club's Staff. The "leg pull" was aimed in quite another direction. (See Club and School notes for the last few weeks).

MIDLAND AERO CLUB

(MAR. 17–23).—The total flying time was 24 hrs. 14 mins. Dual, 7 hrs. 40 mins. Solo, 12 hrs. 35 mins. Passenger, 2 hrs. 55 mins. Test, 1 hr. 4 mins.

The following members were given dual instruction by Flt/Lt. T. Rose, D.F.C., and W. H. Sutcliffe: T. N. Khatri, T. W. Wild, J. H. Stevens, S. W. Farrer, P. B. Hackett, J. N. Fisher, H. J. Barnett, H. Beamish, J. A. Ridsdale, J. W. Astley, F. G. Robinson, G. Norton, H. Coleman, J. E. Hicks.

Advanced Dual: G. C. Jones, M. A. Murtagh, S. G. Hall.

"A" pilots:—R. L. Jackson, S. H. Smith, A. Ellison, R. D. Bednell, M. A. Murtagh, J. K. Morton, E. P. Lane, H. C. M. Shaw, G. C. Jones, J. H. Stevens, W. L. Handley, H. J. Willis, J. Rowley, C. W. R. Gleeson, S. Duckitt, F. J. Steward, W. Swann. Soloists: O. L. Richards, L. H. Lee. Passengers: F. G. Robinson, Miss M. Pryce, J. Hermon, A. Methley, O. W. Banwell.

Easter Holidays.—The club will be closed from Thursday evening until Tuesday morning.

SUFFOLK & EASTERN COUNTIES AEROPLANE CLUB

(MAR. 17–23).—Flying time, 16 hrs. 50 mins. by Suffolk and Cambridge Clubs as follows:—

Suffolk Aero Club.—Total flying time, 12 hrs. 15 mins. Six members were given dual instruction (4 hrs. 40 mins.). Three members flew solo under instruction (2 hrs.). Flights were made by 8 "A and B" licence pilots (4 hrs. 55 mins.). Seven tests were made (40 mins.).

Dr. Dunn completed his tests for "A" licence. Two new members, Mr. Furze and Mr. Forbes, started instruction during the week.

Cambridge Aero Club.—Total flying time, 4 hrs. 35 mins. Two members were given dual (40 mins.). One member flew solo under instruction (20 mins.). Flights were made by 1 "A" licence member (25 mins.). One passenger was carried (3 hrs. 5 mins.). One test was made (5 mins.).

Mr. Doggett, a new member, started instruction. The Club opens permanently with the air display on Easter Monday. On this day flying and associate members will be permitted to join without an entrance fee, thus saving £3 3s. and 10s. 6d. respectively. After that date it will cost £6 6s. and £1 1s. to enrole as a member of the Cambridge Club. All new members joining at the display will be given a free flight. Mr. Prentice will be at Lympne on Good Friday with UH, and will be glad to receive late entries from intending competitors at the Conington Display.

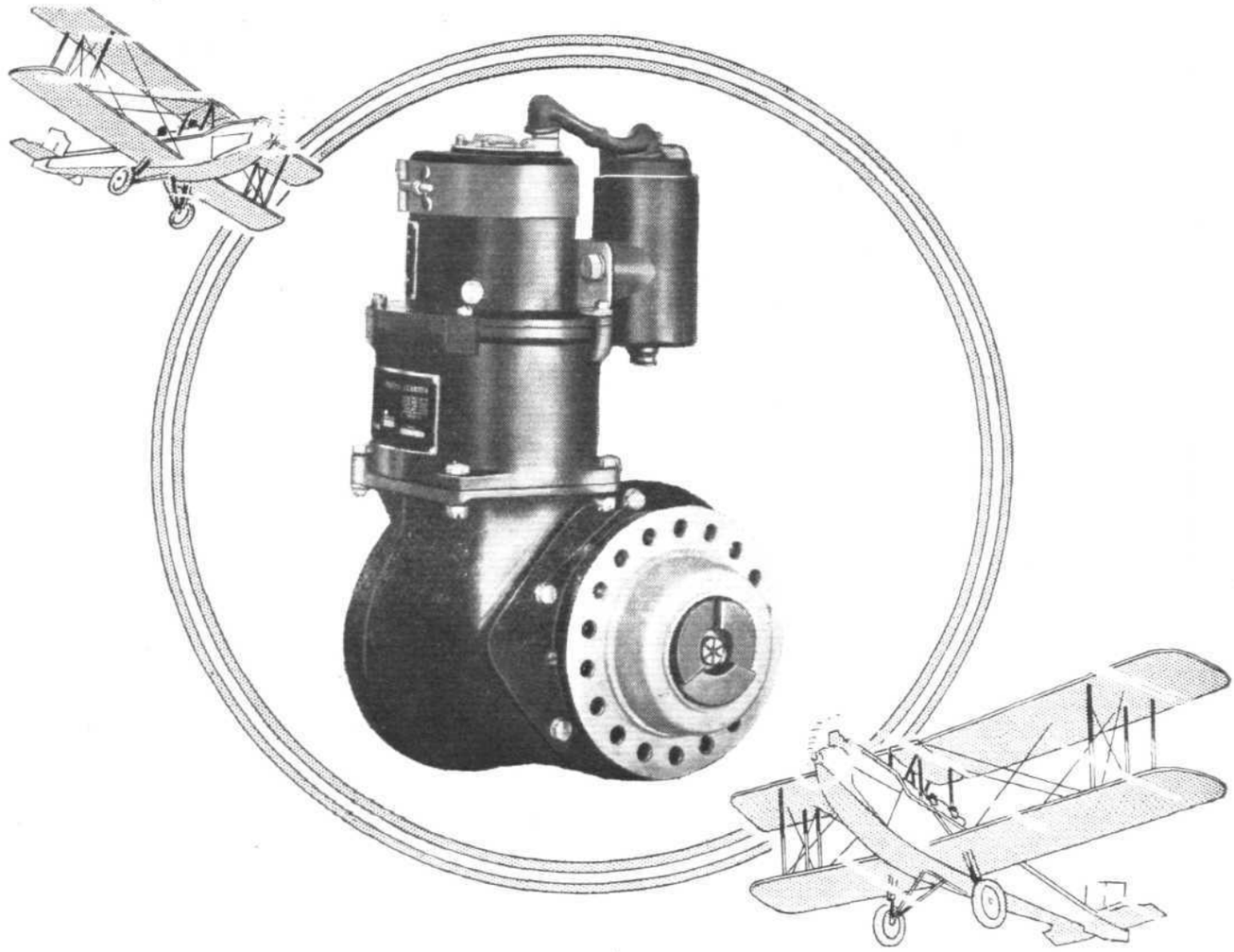
The Marine Aero Club.—Preliminary work in connection with the formation of this club is progressing satisfactorily, and an announcement regarding the opening date will be made shortly. Those interested should write to the Secretary, The Aerodrome, Hadleigh, Suffolk.

Cambridge Air Display.—Now that Cambridge Undergraduates will be permitted to join the Cambridge Aero Club, which is a branch of the Suffolk and Eastern Counties Aeroplane Club, a new significance attaches to this venture. For this reason it has been decided to fly daily at Conington as from April 1 next, and the official opening of the club will take the form of an Air Display. It is hoped by this means to achieve two objects. Firstly to make the club known, and secondly to raise funds towards the erection of sheds and a club house.

The Cambridge Club is at present situated at Conington Aerodrome, which is near the Cambridge Huntingdon Main Road. By air it is best located by looking for Conington Church, which is about 2 miles south from Fen Stanton. The aerodrome is one field away from the church on the south side. During the Display tents, etc., will make a good land mark. By road the turning to Conington is exactly eight miles from Cambridge on the Huntingdon main road. The R.A.C. have kindly agreed to place signs on all roads leading to

B T-H

Inertia Starters for Aero Engines



No more hand cranking

Quick and convenient starting of aeroplane engines is effected by means of the B.T.H. Inertia Starter.

Of minimum weight, and made for hand or electric-motor operation (the latter pattern being arranged for control from the pilot's cockpit), these starters impart a high initial cranking speed to the engine—about 80 r.p.m.—starting the engine in about 5 seconds with motor operation, or 15 to 30 seconds with hand operation.

Made in five patterns to suit engines from 1,300 cub. ins. to 2,500 cub. ins.

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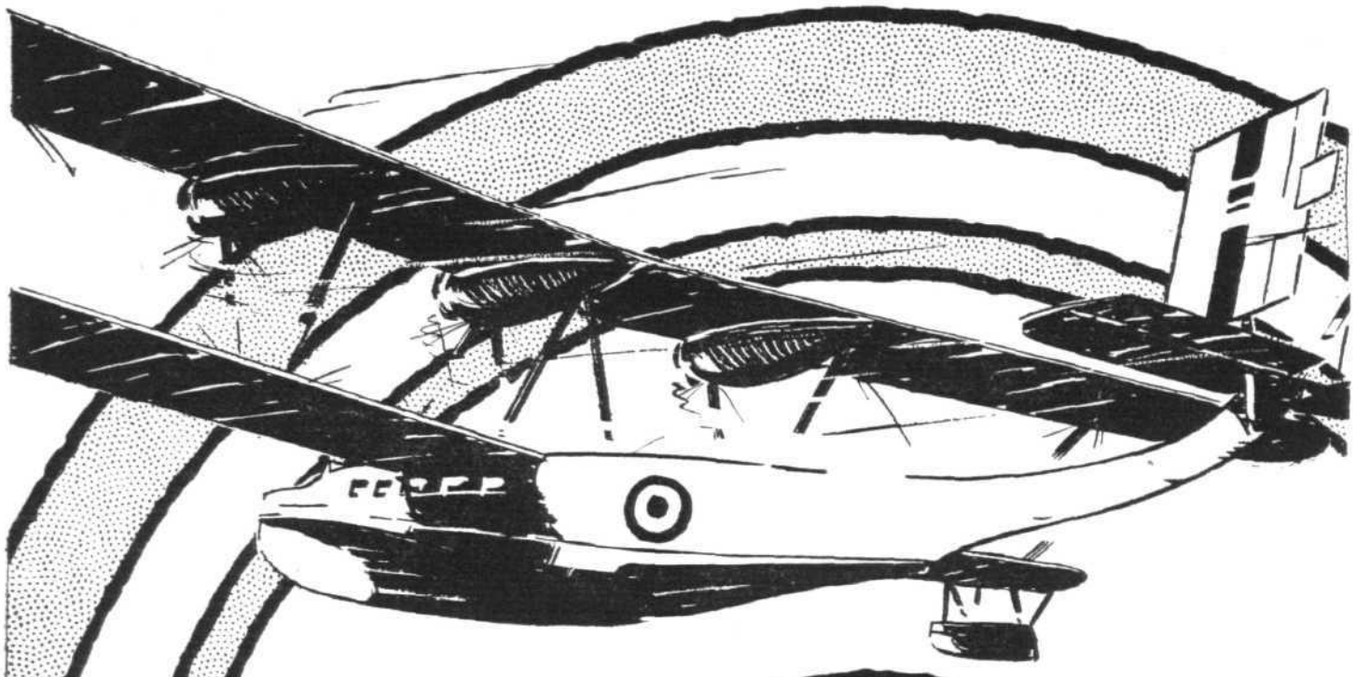
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the aerodrome during the display. They are also arranging the car parks which will be 2*s*. 6*d*. and 1*s*.

The display will start at 10 a.m. with exhibition flights by machines owned by the Suffolk and Eastern Counties Aeroplane Club.

At 11 a.m. the visiting aircraft competing in "The On To Cambridge" will arrive; the first, second and third prizes going to the three competitors who reach the aerodrome the nearest to zero hour, an allowance being made for distance from point of departure.

After this event various types of light aeroplanes will be demonstrated in flight, spectators will be able to visit the machine park and take flights, and the Hon. Lady Bailey, President of the Club, will deliver a short address on her African Flight. This, of course, by the aid of loud speakers.

From 2 p.m. there will be a continuous programme of events until 5.30. The first event will be a grand parade and fly past under the leadership of the Hon. Lady Bailey. There will be three competitive events designed for the amusement of the spectators and visiting pilots alike. These will be an Aerial Golf Contest, a Landing Competition and a Getting-off Competition. There will be first, second and third prizes in all these competitions.

The Chief Instructor of the Suffolk and Cambridge Clubs, Mr. G. E. Lowdell, A.F.M., will give an exhibition of aerobatics, and Mr. Irving has kindly promised to demonstrate the parachute as an educational feature.

OVERSEAS CLUBS

DELHI FLYING CLUB, LTD.

President: The Hon. Sir John Thompson, K.C.I.E., C.S.I., C.I.E. Vice-President: R. E. Grant Govan, Esq. Hon. Sec.: Major C. M. Grant Govan. Asst. Sec.: S. C. Sarup.

REPORT for two months ending February 28, 1929.—Instructor: Capt. A. I. Riley. Ground engineer: A. E. Clifford. Aerodrome: R.A.F. Aerodrome, New Cantonment, Delhi. Flying time: 110 hrs. 15 mins. Instruction, 63 hrs. 45 mins.; soloist (1), 4 hrs. 45 mins.; pleasure flight, 22 hrs. 15 mins.; tests, 19 hrs. 30 mins. Two DH Moth (VT-AAG and VT-AAH, named "Roshanara" and "Delhi."

On Thursday and Saturday, February 21 and 23, both the machines gave flying demonstrations over the Imperial Delhi Horse Show on Tis Hazari ground in the afternoon.

On Wednesday, February 27, 1929, both the 'planes escorted "Hinaidi" and the seven "Victories," which were engaged in the work of evacuation from Kabul to Peshawar, and which arrived in Delhi at 4.20 p.m. Among the distinguished persons who had pleasure flights over Delhi in the month of February were H.H. the Raja of Kalsia and H.H. the Maharaja of Jaipur.

The first pupil to go up solo was Col. J. F. Turner, D.S.O., R.E., who took his first solo flight on January 29.

SINGAPORE FLYING CLUB

(DEC. 1-8.)—Total flying time, 7 hrs. 50 mins. Solo, 20 mins. Dual instruction, 4 hrs. Air experience, 3 hrs. 20 mins. Tests, 10 mins.

The very small amount of flying time put in during the week was due to the fact that both machines were out of action on 2nd, 3rd and 4th instant, and for the rest of the time, only G-EBUK was available. They hoped to be able to send both machines to meet the Far East Flight on their return to Singapore on December 11.

(DEC. 8–15.)—Total flying time, 10 hrs. 55 mins. Solo, 35 mins. Dual, 2 hrs. 50 mins. Air experience, 4 hrs. 20 mins. Joy ride, 20 mins. Special flight, 2 hrs. 50 mins.

On December 11, W. I. L. Legg, with R. R. Gardiner as passenger, flew G-EBUK up to Batu Pahat to meet the Far East Flight on their return. Unfortunately, they started rather too early and were forced to return to refuel without having seen the "Southamptons." On setting out again, however, they met the Flight off Tanjong Bulus and escorted them in. The latter have been away for over a month, having visited Sarawak, Manila, Hongkong, French Indo-China, and Siam.

On December 13, we experienced the first forced landing since the club was formed. At 8.40 a.m. on that day, while over the islands off Pasir Panjang, one of the connecting rods of G-EBUJ snapped, but Flt.-Lt. S. H. Gaskell, who was piloting the machine, had no difficulty in landing, though it was at some distance from the shore. Help was, however, forthcoming from some Malay fishermen, who towed the machine to the nearest land, and it was subsequently taken round to the hangar by the club launch later in the day.

(Dec. 15-22.)—Total flying time, 4 hrs. Solo, nil. Dual instruction, 1 hr. 50 mins. Air experience, 2 hrs. 5 mins. Tests, 5 mins.

We were only able to put in two day's flying that week, owing to G-EBUJ being out of commission with a broken piston and connecting rod, and G-EBUK having suffered from magneto trouble, which took some time to rectify.

(DEC. 22-29.)—Total flying time, 5 hrs. 10 mins. Solo, 45 mins. Dual instruction, 1 hr. 15 mins. Air experience, 3 hrs. 10 mins.

This week's flying time showed very little improvement over that of previous week, due mainly to the same reason, *i.e.*, that only one machine had been in commission, and then only for a couple of days.

(JAN. 1-5.)—Total flying time, 2 hrs. 55 mins. Dual instruction, 10 mins. Air experience, 2 hrs. 45 mins.

Owing to the New Year holidays and further magneto trouble, very little flying was possible that week.

(JAN. 5-12.)—Total flying time, 20 hours. Solo, 4 hrs. 5 mins. Dual instruction, 8 hrs. Air experience, 6 hrs. Joy rides, 1 hr. 20 mins. Tests, 55 mins.

Conditions were more favourable that week, and we were able to put in a very fair amount of flying time, despite the fact that only one machine was in commission.

J. V. Audas (an old war pilot) came down from Ipoh, on January 7, and succeeded in passing all the requisite tests for "A" licence before leaving on the 11th idem. It is hoped to start a flying club in the Ipoh district, of which Mr. Audas is a promoter, shortly, and we wish the enthusiastic originators of the scheme every success.

(JAN. 12-19.)—Total flying time, 50 mins. Dual instruction, 50 mins.

Practically no flying was possible that week, owing to both machines having been out of commission for most of the time.

CINQUE PORTS EASTER MEETING.

WE give below a list of entries for this week's Air Meeting which opens at Lympne on March 29. The principal events down on the programme—apart from exhibitions of aerobatics by Capts. Hubert Broad and Neville Stack—will be: (1) "Alight at Lympne" competition. (2) "Manufacturers' Scratch Race"; and (3) "Cinque Ports Handicap,'

The entries (except for a few, of which particulars have not been received) are:—

Entrant.	Machine.
Capt. G. F. Boyle	D.H. "Moth" (G-AABH).
F./O. A. V. Harvey	Boulton & Paul P.9 (G-EWAS).
Hon. Lady Bailey	D.H. "Moth" (G-AAEE).
G. Merton	D.H. "Moth" (G-EBQZ).
Col. L. A. Strange	Simmonds "Spartan"
"Airways" ..	Avro "Avian" (G-EBZD).
R. Knight	D.H. 53 (G-EBRK).
W. Runciman ..	D.H. "Moth" (G-EBWT).
Capt. T. N. Stack	D.H. "Moth" (G-EBVF).
E. H. Thierry ..	D.H. "Moth" (G-EBZI).
A. H. Wheeler ..	A.N.E.C. (G-EBJO).
A. H. Wheeler ..	S.E. 5 (G-EBQM).
H. R. Law ..	D.H. "Moth" (G-EBYJ).
R. Malcolm ..	D.H. "Moth" (G-AAAI).
Capt. A. M. Blake	Blackburn "Bluebird" (G-EBTA).
C. Prentice ..	Blackburn "Bluebird" (G-EBSZ).
Miss W. Spooner ..	D.H. "Moth" (G-AAAL).
H. Pander	"Pander" (P-HADV).
Maj. L. Redele ..	"Pander" (P-HADW).
Mijnheer Vlaming	"Pander" (P-HAEV).
Capt. R. G. Cazalet	Westland "Widgeon" (G-EBRM).
T. Rose Richards ..	D.H. "Moth" (G-EBWY).
Dr. Whitehead Reid	Westland "Widgeon" (G-EBJT).
H. Ashworth ..	Avro "Avian" (G-EBXJ).
Dudley Watt ..	D.W.I. (G-EBOG).
Capt. Stuart Burt ..	D.H. "Moth" (G-AADH).
T. Rose	S.E. 5 (G-EBTO).
H. Penrose	Westland "Widgeon" (G-EBRM).

British East African Aviation News

CAPTAIN R. R. BENTLEY, the South African pilot, and Mrs. Bentley were proposing to fly from Cape Town to Nairobi this month in their Cirrus-Moth. For six months of their stay in the Colony Capt. Bentley will be chief pilot for British East African Airways, Limited, and will occupy a seat on the board. A well-known aviation company in England will possibly become interested in this concern. Nairobi Aerodrome is now ready. The necessary buildings have been erected and a telephone is being laid on. It is thought that it will become the best aerodrome in Africa. The general meeting of the Aero Club of East Africa was held recently. Membership now stands at 300. The financial position is sound. A cable was read from Sir Charles Wakefield offering to present the Club with a light aeroplane. Of the £3,000 voted by Government for the furtherance of aviation, £450 is earmarked towards the cost of a certified ground engineer to take charge of Nairobi Aerodrome. The Mansfield Robinson Gold Cup was awarded to the late Mrs. Carberry for the most meritorious flight of the year. Landing grounds are slowly making their appearance throughout the country, such as Gilgil, Nanyuki (on the foothills of Mount Kenya) Lonliani (on the route Kisumu-Nairobi) and Nyeri. Mr. John Carberry with Sir Pyers Mostyn, in the latter's Gipsy-Moth encircled the summit of Mount Kenya recently at a height of some 17,000 ft. Magnificent views of the snow fields, glaciers and numerous small mountain lakes were obtained. The airmen stated that the temperature was very low, no trouble of any sort was experienced and the return trip to Nyeri —a drop of some 11,000 ft. and some 30 miles away from the Peak—was made in 17 mins.

Northamptonshire Aero Club

CAPT. A. S. WHITE of the De Havilland Aircraft Co., Ltd., flew the Northamptonshire Aero Club's first machine, a "Cirrus-Moth," to Sywell, Northampton, recently. He was met by the Chairman (Mr. W. Harris), and the instructor and manager (Flying Officer Bunning). Both the hangar and clubhouse are now being finished off. The club has 200 members, which include 30 flying members, and now that this machine has arrived, it is hoped that the number will increase. The club is, incidentally, prepared to do taxying for the general public at suitable rates, and the photographing of factories, etc., from the air will come within their purview.

Flying Officer Bunning is fully qualified as an instructor. He has been flying since 1916, and has handled many different types of machines. He has been engaged for a long time in civil flying since he left the force, and last year he estimates that he carried approximately 4,000 passengers.

EDDIES

ALTHOUGH no doubt the cost of investigating, by the Air Ministry, the air and tide secrets of nature, and recording the results obtained, is a charge against that department in the Air Estimates, the Ministry should be credited with a much wider field of activity on behalf of the good of mankind than solely in the air. One very important direction of this research is in regard to ocean currents, which of course also, in a great measure, affect atmospheric conditions. For years a system has been adopted of consigning bottles containing a Drift-bottle Paper No. 4955 as issued by the Meteorological Office of the Air Mnistry, which when found enjoins the finder to record where it was picked up and to send it to the Air Ministry and thus help to solve the great problem of deep sea currents. By piecing together the records of these floating messages it is hoped by degrees to make navigation an exact science, having regard to the fact that there are close on 500 ships from which these bottles are thrown overboard every day. A magnificent work, for which the Air Ministry gets very little credit.

UNDER the new air agreement between France and Italy their relationship in the Mediterranean should be less strained in the future, having regard to the provision for allowing Italy to construct commercial air stations at Marignane (near Marseilles) and Tunis. This will enable her to complete her air lines in the Western Mediterranean between Trieste, Barcelona, and Tunis. *Per contra*, France is allowed to send commercial aircraft over Italian territory, and to establish stations at Naples and at Castellorigo in the Adriatic, which will enable her to organise the air line from Marseilles to Beirut.

WE welcome Mr. W. V. G. Christensen as a co-optimist with ourselves in regard to the future of cross-Channel traffic, when he writes doubting whether the Channel tunnel will ever materialise, adding that by the delay in commencing it, it will be probably found that the present-day development of the air ports and air liners, the Continental passenger crossing will pass into the hands of the aero companies, who will be running hourly services at cheap fares of up-to-date all-weather air liners quicker and more direct than any steamer, Channel tunnel, or train ferry.

NO doubt there is a good deal in the above, but at the same time it cannot be lost sight of that fog is not a particularly good asset, even to flying, and, for a time at least, even we are unable to visualise an air service that would be capable of handling daily many thousands of tons of cargo and heavy packages that without question would seek to be conveyed via a railway tunnel.

FOLLOWING the Wandsworth Borough Council's protest against the establishment of aerodromes in their district, they have now passed a definite resolution against this procedure. Just wondering *how* they can carry out their edict, and, assuming they can do so, it would seem as if it were about time there should be a "court of appeal" against such decisions based upon purely local interests versus communal rights, in similar manner to appeals for the granting of licences for public vehicles in provincial urban centres where local interests have refused to admit fair competition into their district.

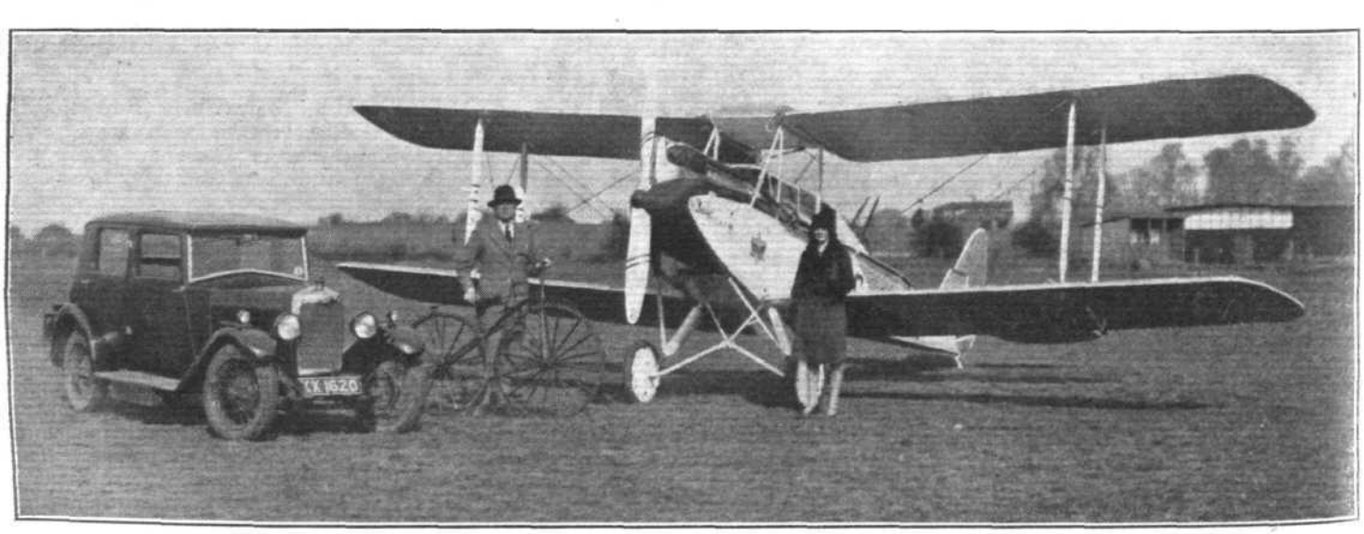
VENTURERS in the Arctic regions have indeed to be prepared against many emergencies, and the latest report from Commander Byrd's Antarctic expedition details just one weird experience, fortunately, in this case, with not unduly serious consequences. Owing to the stranding of the members of the Advance Party by reason of the wrecking of Mr. Balchen's aeroplane due to a terrific gale which prevented the sending of wireless messages, Commander Byrd had himself to take up the search for them on another aeroplane, fortunately, after an hour and a half on the rescue trip, with the happiest results, and the return of himself, his crew and of two of the advance party to safety, although not actually reaching their "base" of "Little America." The trouble to Mr. Balchen's machine apparently was caused by a 120 to 150 miles an hour gale which is reported by the *New York Times* to have torn the plane from the snow and the lines by which it was anchored, dropping it a splintered wreck on a glacier a mile away. The men worked in the dark for hours, battling with the gale. At times it momentarily blew them straight out from the lines they were holding and pelted them with lumps of snow from a mountain two miles away. When resting, Mr. Gould and his companions had to lie flat and hold themselves in place by means of knives and ski-sticks stuck in the ice. Only a sloping wall of snow-blocks prevented their tent from being blown away. After this even our dear old English climate can take a back seat.

REGARDING Antarctic research, Sir Hubert Wilkins has again strongly emphasised the great value of aviation in regard to the relationship between Commerce and Polar flying, he being particularly pleased with the fact that both in the North and South it had been possible to use ordinary commercial aeroplanes. In one of his short flights to the South, he said, when speaking at the British Chamber of Commerce in New York the other day, he discovered more than a thousand miles of new territory, more than twenty islands, several hundred mountain peaks, two water channels and a new part of the Autarctic continent.

I wonder how long prior to the use of aircraft such a record would have taken?

AS was hoped, the Empire Air Mail service *will* start this week-end, the original route being followed, thanks to Italy's good offices. So all's well that ends well, and now Air Mail philatelists will, if they are lucky, be able to despatch their 10,000 more or less "covers" for the acquiring ultimately by amateur collectors.

AEOLUS



["FLIGHT" *Photograph*

PROGRESS IN TRAVEL:—Here we get symbols of the rapid developments in mobility; from an old-fashioned bicycle to a modern Riley-Nine Monaco Saloon car, and so to the new luxurious Coupé Gipsy-Moth of Mr. Jackaman's, who is seen with Miss Jackaman, his sister.



THE LONDON-KARACHI AIR LINE

The BRISTOL "Jupiter"

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Armstrong-Siddeley "Jaguar"

engines used throughout this new service of Imperial Airways to be inaugurated on March 30th, will all be lubricated with

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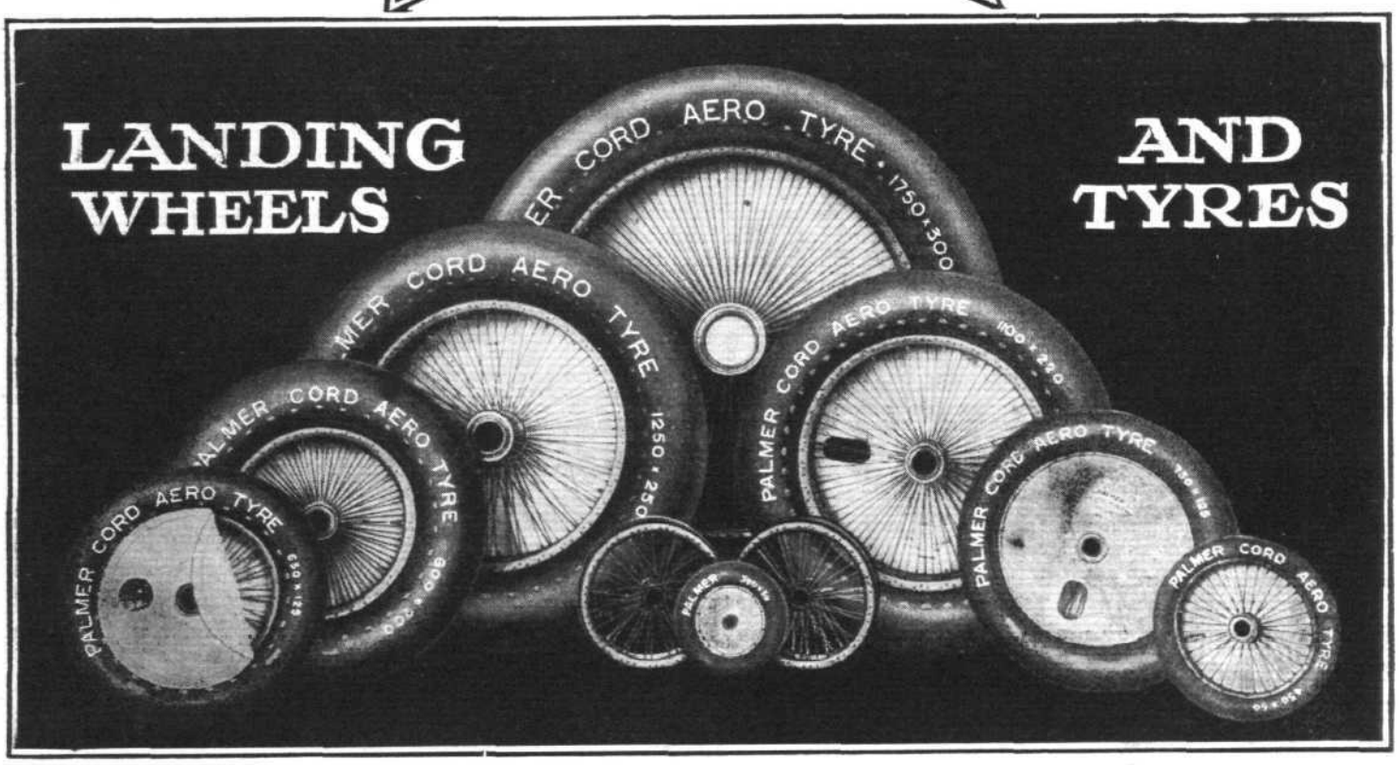
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Tyre Size	Wheel No.	Hub Length	Hub Bore	Track Line	Tyre Size	Wheel No.	Hub Length	Hub Bore	Track Line	Tyre Size	Wheel No.	Hub Length	Hub Bore	Track Line
		m/m	m/m	m/m			m/m	m/m	m/m			m/m	m/m	m/m
575×55	168	111·12	25·4	Central	700×100	176	178·	44·45	Central	1000×180	148	220·	80·	Central
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,,	190	150·	38·09	Central	,,	95	185·	55·	Central					
					,,	99	178·	38·89	132/46	1100×220	134	220·	66·67	Central
600×75	21	160·	28·	Central	,,	112	150·	38·09	Central	,,	136	250·	80·	Central
,,	180	150·	38·09	104/46	,,	176	178·	44·45	Central					
,,	186	120·	34·92	Central	,,	179	178·	55·	132/46	975×225	192	185·	60·32	Central
,,	190	150·	38·09	Central						,,	194	185·	55·	125/60
					800×150	161*	185·	55·	135/50					
700×75	78	178·	44·45	132/46	,,	162*	185·	55·	Central	1250×250	314	250·	80·	Central
,,	79	178·	44·45	Central	,,	163*	185·	66·67	135/50	,,	154	304·8	101·6	Central
,,	100	178·	38·09	132/46	,,	169†	185·	55·	135/50					
,,	101	178·	31·75	132/46	,,	177	185·	55·	135/50	1500×300	305	304·8	152·4	Central
,,	196	178·	55·	Central	,,	183	185·	55·	Central	,,	306	304·8	101·6	Central
					,,	211*	185·	60·32	135/50					
600×100	188	120·	34·92	Central						1525×325	197	304·8	101·6	Central
,,	304	150·	38·09	104/46										
,,	333	120·	34·92	Central	1000×150	167	185·	55·	125/60					
					,,	174	250·	80·	Central	1750×300	139	400·	152·4	Central
700×100	77	178·	44·45	132/46	,,	182	185·	55·	Central	,,	191	350·	150·3	Central
,,	92	185·	55·	135/50	,,	187	220·	66·67	Central					
,,	95	185·	55·	Central	,,	201	185·	60·32	125/60					
,,	99	178·	38·89	132/46	,,	210	185·	60·32	Central	1750×350	193	400·	125·	Central
,,	112	150·	38·09	Central										

*Wheels Nos. 161, 162, 168, and 211 are of stronger type than the other wheels for 800 × 150 tyres. †Wheel No. 169 is fitted with Ball Bearings
Grease gun equipment is now a standard fitting on all wheels. (L/NB)

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(572)

CORRESPONDENCE

DETAIL STRESSING

[2183.] IN THE AIRCRAFT ENGINEER of January 31, 1929, there appeared an article by Mr. Parkinson on "Detail Stressing." It occurs to me that Mr. Parkinson's table is incomplete. The values in the second column are calculated on the full area of the corresponding bolt. Now the criterion for the tesile strength of standard bolts is the core area; hence, either an additional column must be included in the table giving basic load for the core area, or alternatively, another correction factor must be employed. The alternative is derogatory to the value of the table as a labour and time-saving device.

Finally, I should like to point out that the use in the table of the symbols f_s, f_t, and f_b to denote the tabulated quantities is incorrect. By well defined use these symbols represent *intensity of stress*, whereas the values in the table represent loads at a stress intensity of 10 tons per sq. in.

London, March 4, 1929. R. RODGER

LIGHT 'PLANE DESIGN COMPETITION

[2184] Through the medium of the *Scientific American* an American firm of aero-engine manufacturers has just instituted a competition for a design of a light 'plane for two people, and is offering a prize of $500 for the best design submitted by an American before October 1, 1929.

Calculations as to stresses, factors of safety, estimated performances, etc., must be included, together with a description of the design.

It seems a pity that a similar competition could not be instituted in this country; not that any design submitted would be likely to be a great improvement on existing machines, but it seems quite possible that some ideas might be discovered for the "improvement of the breed," that, as they stand, or when taken in hand by a capable designer, would lead to substantial advances in one way or another.

Rather naturally from the nature of the competition in the *Scientific American*, the designer is tied down to a particular type of engine, but it would appear preferable to allow the use of any engine in production at present, and merely to set a limit to the horse-power or to the weight of the total machine, or, possibly, the dimensions of the 'plane.

A pooling of ideas, such as this often leads to refinements in design, do you not think?

T. W. E. B.

Dungannon, February, 1929.

PIONEER BRITISH DESIGNERS

[2185]. Speaking as one keenly interested in aeroplane design from the obscure days of 1902, I am pleased to see that the pioneer work of A. V. Roe in the field of practical flying has at last been appreciated in a public-spirited manner. I am sorry he was not acclaimed the first man to fly in Britain (he richly deserved to be), because he worked harder than any other, and only failed because he lacked the financial support which others could command. In commenting upon his early research work published in FLIGHT, March 7, I must take exception to the following statements: "Aircraft pioneers' were exclusively concentrating on box kites"; "Roe had the right ideas as to what an aeroplane should be"; "He sensed the advantages of the tractor, and was the pioneer of the enclosed machine." Although unknown in the field of aeronautics to-day, on evidence I can justly claim to be a pioneer in model aeroplane design, in which I visualised the practical aeroplane of the future, and from which design most modern machines have been developed. In 1902 I won the first prize for aeroplane design presented by the president of the Aeronautical Society. This machine had an enclosed body, a non-lifting tail with hinged elevating flaps and slotted wings, the angle of incidence of which could be controlled by the aviator in flight to vary the speed of the machine. One of my patents on this design passed through three editions, evidence that it has been extensively cited against aeroplane inventors and that it proved a good investment for the Patent Office at 1s. per copy. In 1907, at the *Daily Mail* competition I flew the first corrugated all-metal aeroplanes embodying the tractor propeller, the hemispherical entry enclosed streamline body, non-lifting tail with hinged elevating flaps, no external struts or wire bracing. This model flew at a speed of over 30 m.p.h. to a height of 25 ft., but smashed when it struck the ground due to the high speed. The Roe paper-and-string Langley-type pusher machine flew at 6 m.p.h. at a height of about 3 ft. from the ground and embodied no features incorporated in modern machines.

As design was not considered in the competition, the merits of my machines were not then appreciated by the judges. The late Hon. Charles Rolls, in describing the models in the *Evening News*, said that my designs and my system of construction would be extensively used in future aeroplanes and airships. Prof. Junker has proved this prophecy true in aeroplanes. America is now proving it true in rigid airship construction, which the Air Ministry has turned down. Instead, they are spending money on the fabric-covered types which Dr. Eckner tells us are not practical for all-weather service, with which statement I am in agreement. The solution of the airship problem is in the all-metal, corrugated, rigid type, built on my patented tension system, operating an auxiliary system of hydraulic propulsion.

WILLIAM COCHRANE

London, March, 1929.

[We have inspected Mr. Cochrane's design for a metal-covered airship, and his ideas are certainly ingenious.—ED.]

TRANSATLANTIC FLYING

[2186] In renewing my subscription to FLIGHT, I wish to tell you of my appreciation of your magazine. I also wish to make a few suggestions on the matter of flying-boat use commercially, and in particular in connection with trans-atlantic flying.

You have steadfastly opposed the transatlantic flying of the past two years with landplanes, and in that attitude I believe you were right. However, I think the time is now ripe to advocate a flying-boat service between Clifden, Ireland and St. John's, Newfoundland and return. As you remark in your Editorial Comment in the issue of January 17, regarding the establishment of Empire flying-boat services, that the only causes for delay now are political and financial, and not technical, so I believe that a commercial service between Newfoundland and Ireland is not only practical, but is also necessary and very desirable.

The Germans are already planning a commercial service over a Southern route, and I believe that will almost make the establishment of a service such as I have outlined necessary if British prestige is not to suffer. Ten years ago this June, this service was really started when Alcock and Brown flew from St. John's to Clifden in 16 hours 12 minutes. Surely, we have made sufficient progress in ten years to warrant the backing of a service over the trail blazed by Alcock and Brown ten years ago!

A radio beacon at St. John's and one at Clifden should make navigation comparatively easy. As "The Seaplane Journal," I hope you will treat this idea editorially, and that steps may be taken to have a commercial service across the Atlantic at least during the summer months of 1930. If any firms over there would be interested, I should be glad to get into such a service as an American agent.

Again congratulating you on the fine magazine which you publish,

DENIS F. CASHMAN

Dayton, Ohio, February, 1929.

◈ ◈

Mediterranean Air Lines

THE Air Convention between Italy and France was signed in Turin by General Balbo on behalf of Italy and by the Air Minister, M. Laurent-Eynac, on behalf of France, on March 10, writes a *Times* correspondent. Although the text of the Convention will not be made public until after its presentation to M. Poincaré and President Doumergue, it is understood to provide for an air port in the Italian island of Castel Rosso (Castellorizo), off the south-west corner of Anatolia, to be used by the French air line across the Mediterranean to Syria, and for the constitution of a direct air line between Genoa and Marseilles, and another between Italy and Tunis. The Marseilles air port is already used by the Genoa-Barcelona air line, and this practice will now be legalised by the Convention. The Genoa-Marseilles-Barcelona air line will be connected with the other already working between Trieste, Venice and Turin, with a stop at Milan, where the air port is under construction. Thus, with the Marseilles station a very important air line from the Adriatic to the northern Mediterranean will be constituted, uniting the ports of Trieste, Venice, Genoa, and Marseilles, and touching the two greatest industrial and commercial centres of Italy, Milan and Turin. The air line to Tunis is viewed with particular interest in Italy on account of the great number of Italians who reside there. From the political point of view the conclusion of the Convention is considered as a good omen for the future relations between Italy and France.

THE ROYAL AIR FORCE MEMORIAL FUND

THE usual meeting of the Grants Sub-Committee of the fund was held at Iddesleigh House, on February 28. Mr. W. S. Field was in the Chair, and the other members of the committee present were :—Mrs. L. M. K. Pratt-Barlow, O.B.E., and Sqdn.-Ldr. Douglas Iron, O.B.E. The committee considered in all 10 cases, and made grants to the amount of £190 10*s*.

The first meeting of the new year of the Executive Committee of the above Fund was held at Iddesleigh House, March 13. The Committee proceeded to give formal approval to the Annual Report for 1928, and their acceptance and approval of the accounts, both as regards the General Fund and the Vanbrugh Castle School account, and the Report, when printed, was ordered to be issued to all concerned. The Report shows very great progress, both in receipts from all sources, and in the distribution of relief of all kinds, both to past and present members of the Royal Air Force.

The Chairman, Lord Hugh Cecil, to the regret of the Committee, found himself compelled to persist in his wish to resign the Chairmanship of the Executive Committee in view of heavy pressure of work, and the Committee in accepting his resignation, passed a resolution of warm thanks for his services to the Fund as Chairman during the past 10 years.

The new Chairman, Sir Charles McLeod, was unanimously elected to the chair, and, at the same time, at the express wish of the Committee, consented to retain the post of Honorary Treasurer to the Fund, which he has filled since its inception in October, 1919.

The resolution of thanks to the late Chairman was proposed by Dame Helen Gwynne-Vaughan, and further remarks of warm thanks were made by Air Chief Marshal Sir John Salmond, both on behalf of the Executive Committee of the Fund, and of the Royal Air Force itself.

Vanbrugh Castle School opened for the Spring Term on January 8, with 33 boys, and several vacancies, due to a number of boys having passed into the Royal Air Force, are in process of being filled.

The Committee received, with very great pleasure, a further offer of the munificent sum of £5,000, in addition to a generous donation of £10,000 which was presented to the Fund in the autumn of last year by an anonymous donor. The £5,000 will be added to the previous sum, and will constitute a Fund towards the education of the sons and daughters of officers of the Air Force, past and present, and the annual income, which is at present about £480, will be augmented by an additional £240 in respect to this further very handsome contribution. The next meeting of the Executive Committee was fixed to take place on April 24.

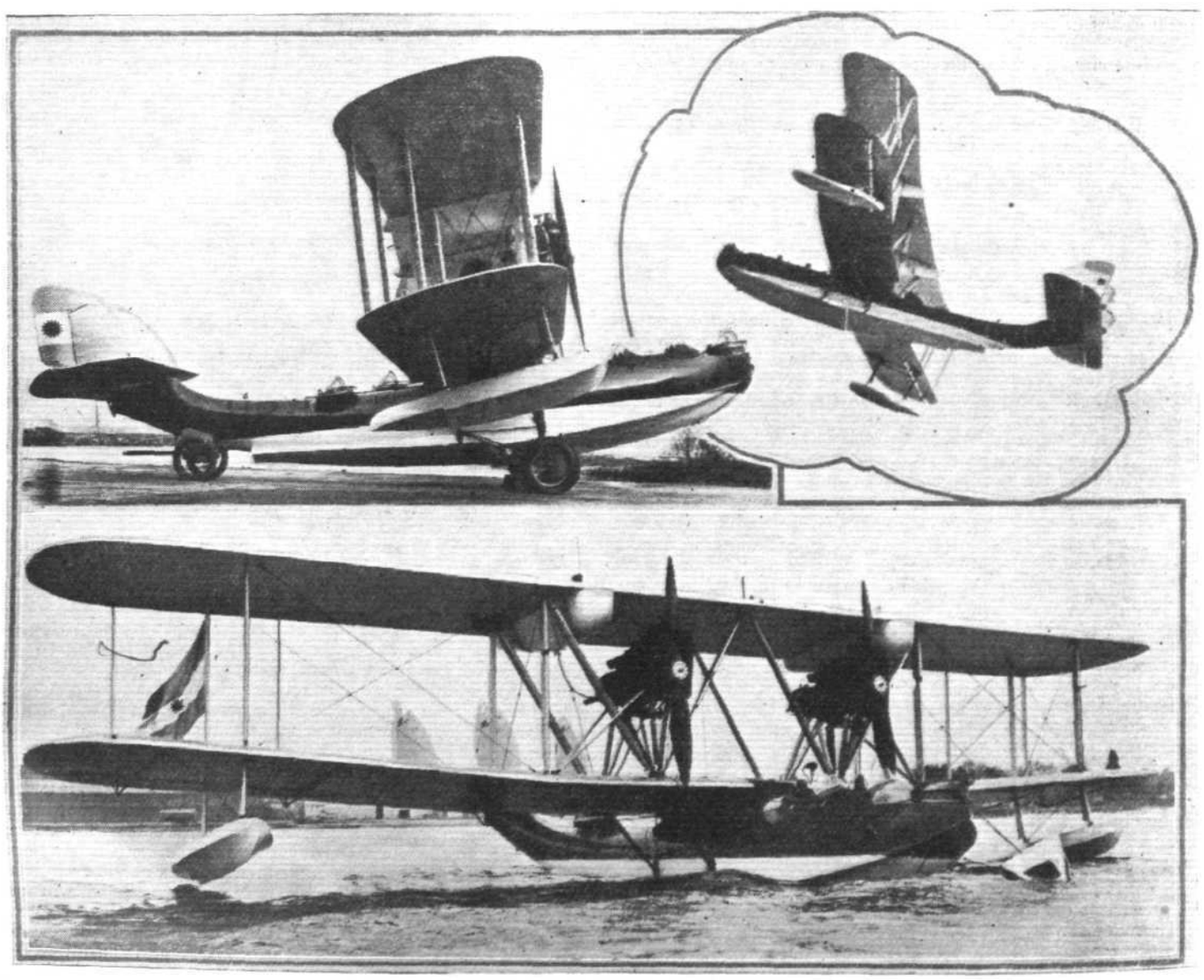
◈ ◈

Hard Luck

THOSE who intend going to the A.I.D. Dinner on April 19 at the Hotel Russell, W.C., and read our paragraph last week which stated that the tickets were 10*s*. 6*d*. each, *inclusive* of wines, must have smacked their lips in anticipation of a cheap night. Unhappily we must dash their pleasure. The 10*s*. 6*d*. ticket is *exclusive* of wines. Sorry !

New Air Ministry Aerodrome

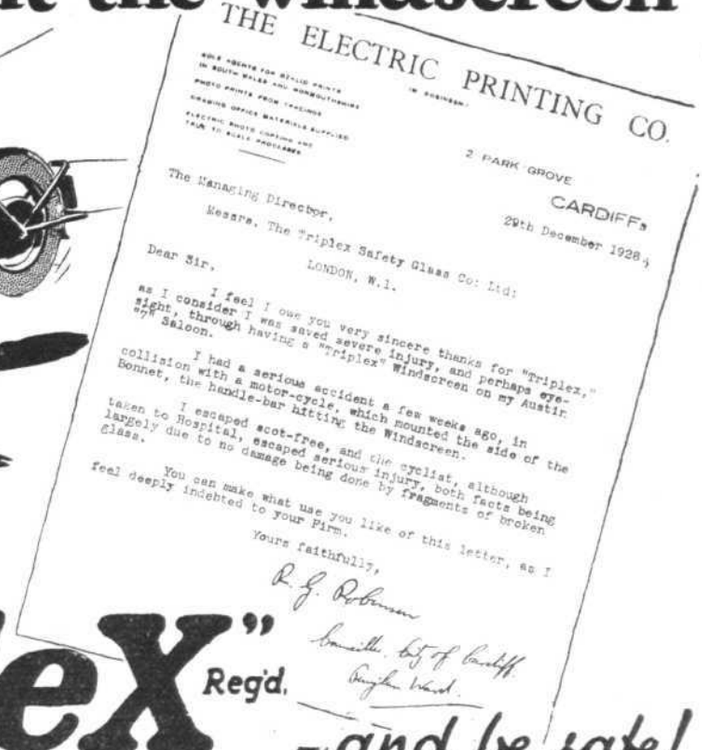
THE Air Ministry has purchased 150 acres of land at Thornaby-on-Tees for an aerodrome.



SOUTHAMPTONS" FOR THE ARGENTINE : Acceptance tests have just been carried out with the first Lorraine-engined Supermarine flying-boats ordered for the Argentine Naval Air Service, Commander Zar and Lieut. Portillo observing the tests officially.

"the handlebar hit the windscreen"





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December, 1928.

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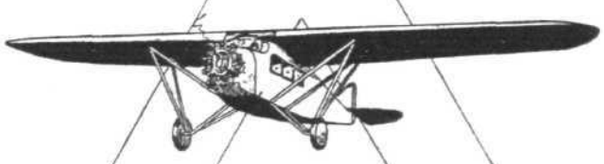
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THE ROYAL AIR FORCE

London Gazette, March 19, 1929.

General Duties Branch

The follg. are promoted with effect from March 20 :—

Flight Lieutenants to be Squadron Leaders.—F. M. Rope, C. S. Richardson, M.B.E., D. S. Don, R. S. Sugden, A.F.C., H. E. P. Wigglesworth, D.S.C., E. J. Cuckney, D.S.C.

Flying Officers to be Flight Lieutenants.—M. C. Pascoe, R. O. Jones, P. G. Chichester, A. F. Hutton, F. F. W. Hall, R. A. Seaton, A. W. Rowbotham, R. H. Carter, R. T. Taaffe, N. Young, J. E. G.-H. Thomas, E. A. McKinley-Hay.

Flight Lt. H. A. Anson is placed on half-pay list. Scale B (Feb. 28, 1929, to Feb.27, 1930, inclusive). The follg. Flying Officers are transferred to Reserve, Class A :—W. D. Baxter, E. A. H. Fisher, R. A. Ford, A. N. Francombe, A. D. McDowall, A. L. Macmillan, W. V. R. Nicholl, C. S. Staniland (March 15). Flight Lt. R. L. Bateman is transferred to Reserve, Class A (March 18).

Medical Branch

Group Capt. C. E. C. Stanford, D.S.O., M.B., B.Sc., is placed on retired list (March 20).

Memorandum

The permission granted to D. H. Farrar to retain honorary rank of Sec. Lt. is withdrawn on his conviction by the Civil Power (Jan. 25).

RESERVE OF AIR FORCE OFFICERS

General Duties Branch

The follg. Pilot Officers on probation are confirmed in rank :—D. Price, C. R. F. Wintringham (March 14); R. W. Burkitt, R. W. H. Knight (March 15); W. E. Hampton, P. G. Philcox (March 19). Flying Officer G. R. Beck is transferred from Class A to Class C (March 17); Flying Officer H. J. Wykes relinquishes his commn. on account of ill-health and is permitted to retain his rank (March 20).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified :—

General Duties Branch

Air Commodore Hon. J. D. Boyle, C.B.E., D.S.O., to H.Q., Air Defence of Britain, Uxbridge, for Air Staff Duties, 7.12.28.

Group Captain F. K. Haskins, D.S.C., to R.A.F. Depot, Uxbridge, Supernumerary, 25.2.29; to Station H.Q., Worthy Down, pending taking over command, 4.4.29.

Wing Commander J. Sowrey, A.F.C., to R.A.F. Depot, Uxbridge (Non-effective Pool), 24.2.29.

Wing Commander E. W. Norton, D.S.C., to Station H.Q., Worthy Down, to Command (temporarily), 7.12.28.

Squadron Leader K. H. Riversdale-Elliot, to 23 Group H.Q., Grantham, 18.3.29.

Flight Lieutenants L. Eardley-Wilmot, to R.A.F. Depot, Middle East, 22.2.29; C. F. Sealy, to H.Q., Middle East, 28.2.29.

Flight-Lieutenants : L. M. Elworthy, to 25 Sqdn., Bircham Newton, 1.3.29. W. H. Poole, A.F.C., M.M., to School of Photography, S. Farnborough, 25.3.29. E. Drudge, M.B.E. to Central Flying School, Wittering, 4.3.29. G. G. Walker, M.C., to No. 1 Flying Training School, Netheravon, 8.3.29. J. L. Wingate, to R.A.F. Depot, Uxbridge, 15.3.29.

Flying Officers : H. H. V. Tristem, to Armament and Gunnery Sch., Eastchurch; 4.3.29. B. F. R. M. Freeman, to No. 26 Sqdn., Catterick; 21.2.29. A. E. Hill, to R.A.F. Base, Calshot; 21.2.29. (Hon. Flight-Lieut.) R. W. M. Hall, to Central Flying Sch., Wittering; 11.2.29. C. A. Anderson, to Armoured Car Wing, Iraq; 1.2.29. D. L. Thomson, to Aircraft Depot, India; 12.2.29. L. G. Rumsey, to No. 12 Sqdn., Andover; 31.1.29. E. G. Olson, to Aircraft Park, India; 9.2.29. R. A. Barnett, to No. 2 Armoured Car Co., Middle East; 26.1.29. K. C. Netherton, to Sch. of Army Co-operation, Old Sarum; 1.3.29. A. E. Thomson, to R.A.F. Base, Gosport; 27.2.29. H. R. F. Baxter, to No. 13 Sqdn., Andover; 4.3.29. J. E. Davies, to R.A.F. Depot, Uxbridge; 16.2.29. A. J. Thompson, to R.A.F. Depot, Uxbridge; 16.2.29.

Pilot Officers : N. A. Pearce, to Night Flying Flight, Biggin Hill; 26.1.29. L. V. G. Barrow, to No. 2 Flying Training School, Digby; 7.2.29.

Pilot Officers : D. J. Hughes-Morgan, to R.A.F. Training Base, Leuchars, 16.2.29; A. R. C. Mackenzie, E. C. Ridler and E. C. A. Wheeler, to R.A.F. Depot, Uxbridge, 24.2.29.

The undermentioned Pilot Officers are all posted to No. 1 Flying Training School, Netheravon, with effect from 10.3.29 :—R. E. H. Beaton, E. D. Bishop, G. H. A. Blackwood, A. F. C. Booth, R. C. A. Brooke-Beer, E. A. Cooke, R. A. Davies, C. S. Gill, F. R. W. Goad, T. W. Hoyle, M. M. Jackson, L. E. Jarman, E. H. Jennings, G. P. Longfield, G. P. Marvin, V. R. Moon, G. E. Mustard, P. J. Pratt, H. D. Primrose, W. M. Rankin, G. N. Roberts, H. L. Smith, D. W. Smythe, R. M. Swaine, A. C. Watson and T. H. Wilson.

Accountant Branch

Wing Commander T. H. Evans, to H.Q., Inland Area, Stanmore, 16.2.29.

Medical Branch

Flight-Lieutenant H. Penman, M.B., to H.Q., Middle East, 8.3.29.

Flying Officer G. W. Paton, M.B., to H.Q., Iraq, 8.3.29.

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IN PARLIAMENT

Empire Airships and Mooring Towers

SIR SAMUEL HOARE, on March 20, in reply to Col. Woodcock, said His Majesty's Government in Canada have erected a mooring-tower at St. Hubert, Montreal, and hope that it will be finally completed early in May. His Majesty's Government in the Union of South Africa have acquired a site for the erection of a mooring-tower at Grautville, Natal, but construction has not yet begun. As regards India, it is expected that the mooring-tower at Karachi will be completed during the summer, and I think the South African mooring-mast will be ready when we are in a position to make flights to South Africa.

Civil Aviation Subsidies, &c.

SIR S. HOARE, in reply to Mr. Viant, said the addition to the subsidy for the financial year 1928-29 in respect of the provision of payment by Imperial Airways for the two Calcutta flying-boats handed over to that company by the Air Ministry falling within the financial year 1929-30 would be £40,000. The amount of subsidies paid to air transport services during the financial year 1927-28 was £226,400, of which £137,000 was in respect of the European services of Imperial Airways, Ltd., and £89,400 in respect of the Eastern services of that company. The total expenditure borne by the Air Ministry during the financial years 1926-27, 1927-28 and 1928-29 (to date) in respect of ground organisation, including pay of personnel, travelling expenses, works, technical equipment and instruments, is £26,516, £7,155 and £3,118 respectively.

Royal Air Force Reserve

MR. DAY asked the number of officers in the Royal Air Force Reserve who have been sen t to any aircraft companies' school during the 12 months ended to the last convenient date; and what amount has been paid for this training ?

Sir S. Hoare : During the year ended December 31, 1928, 608 officers and airmen of the Royal Air Force Reserve completed courses of training at the civil flying schools, and the fees paid for their training amounted to £199,000.

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AIR MINISTRY NOTICES

NOTICES TO GROUND ENGINEERS

Flexible Stranded Cables in Flying Controls

1. It has been found that cables of four-strand construction, *e.g.*, 4 × 19, wear rapidly in aircraft flying control systems, especially at those points where the cables are protected by Bowden sheathing, the cause of this being the relative movements of cable and sheathing.

2. Existing cables of four-strand construction are to be examined immediately, and for this purpose any protective sheathing is to be moved so that the whole of the cable can be seen. If there are any signs of wear the cable is to be replaced forthwith in accordance with para. 3 of this Notice. Any four-strand cable not required to be so replaced is to be frequently examined, and any Bowden sheathing is to be moved on each of these occasions to enable the covered portions of the cable to be examined.

3. In future the cable used in flying control systems must be of the seven-strand construction to current B.E.S.A. specification, and no Certificate of Airworthiness will be issued or renewed unless cables of this type have been fitted.

4. Cables of the type mentioned in para. 3 above that are protected at points by Bowden sheathing should also be examined immediately by moving the sheathing so that the whole of the covered portion can be seen, and this operation must be repeated on each occasion that an aircraft is inspected for renewal of Certificate of Airworthiness.

5. CANCELLATION.—The above information is substituted for that contained in N/G.E No. 6 of 1929, which is hereby cancelled.
(No. 8 of 1929.)

Westland "Widgeon" Aircraft ; Essential Modifications

1. The modification described herein must be satisfactorily incorporated in all Westland "Widgeon" aircraft before any such aircraft is submitted for inspection for issue or renewal of a Certificate of Airworthiness.

2. *Fuel Tank.*—The fuel tank is to be modified in accordance with Drawing No. A.R. 1418. This modification, which is necessitated by the possibility, with the present arrangement, of a stoppage of the fuel flow, due to the collection of vapour on the fuel tank gauze, may be briefly described as follows :—

(*a*) A stack pipe is to be sweated into the existing elbow of the tank sump.
(*b*) A 22 S.W.G. reinforcing plate is to be bolted and sweated to the bottom of the sump for elbow fixing.
(*c*) The wire gauze at the bottom of the tank, above the sump, is to be pierced with ⅜-in. holes all round the stack pipe; these holes can be conveniently made with a pointed steel rod through the filler.
(*d*) The fuel filter is to be of Air Ministry type (A.G.S. No. 600) with cleaning connections.

3. *Fuel Tank Supporting Cables.*—All existing 5-cwt. cables supporting the fuel tank in the main plane are to be replaced by standard 10-cwt. cables at the earliest opportunity.

4. No Certificate of Airworthiness will be issued or renewed in respect of any Westland "Widgeon" aircraft unless the above-mentioned modifications have been satisfactorily incorporated.
(No. 9 of 1929.)

NOTICE TO AIRMEN

Class "B" Pilots' Licences : Revised Requirements. Master Pilots' Certificates : Qualifications Required

1. AMENDMENTS to the Air Navigation (Consolidation) Order, 1923, and to the Air Navigation Directions, 1928 (A.N.D.7) have recently been issued in the following publications :—

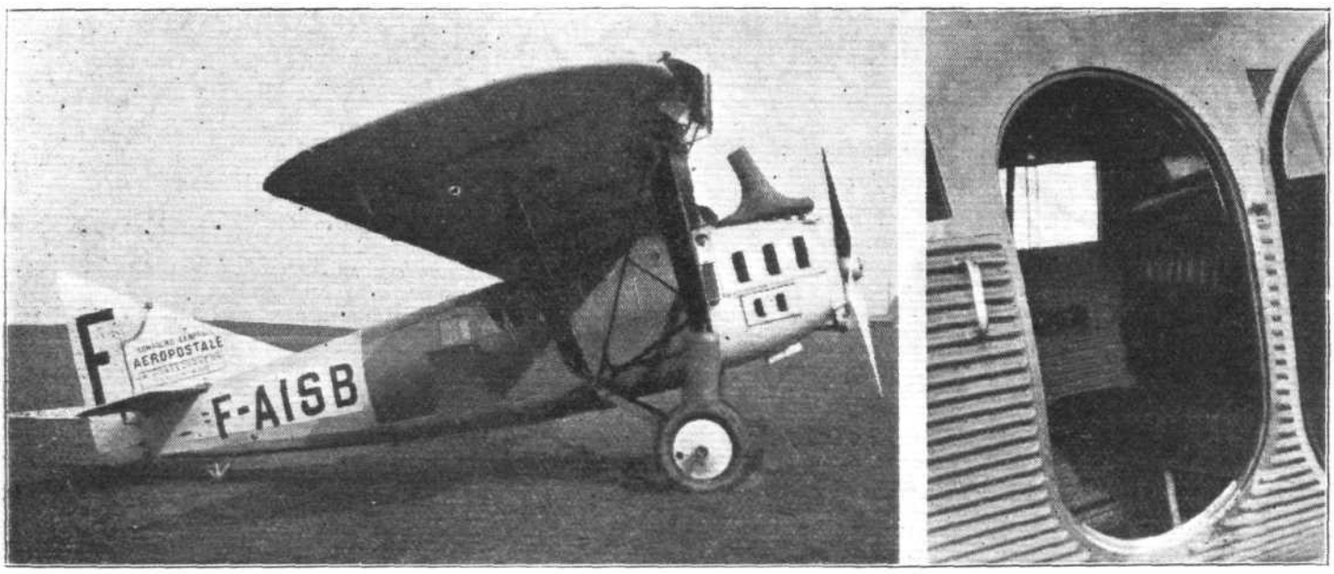
The Air Navigation (Amendment) Order, 1929 (Price 1*d.* net).

The Air Navigation Directions, 1929 (A.N.D.7A) price 1*d.* net).

2. These amendments contain particulars of the alterations made in the fees and the requirements for the issue of class "B" pilots' licences, and also particulars of the qualifications required for the issue of master pilots' certificates.

3. Copies of the publications in question, as well as copies of the Air Navigation (Consolidation) Order, 1923 (price 1s. 1*d.* net) and the Air Navigation Directions, 1928 (A.N.D.7) (price 4*d.* net), which are necessary in order to secure the full regulations on the subject, are obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2.

4. CANCELLATION.—Notice to Airmen No. 3 of 1929 is hereby cancelled.
(No. 20 of 1929.)



["FLIGHT" *Photographs*]

AILES A FENTE : A Latécoère, Type Lat. 25, has recently been fitted with Handley Page Automatic Wing] Tip Slots. The cabin of this all-metal machine is very comfortably appointed.

Handling and Mooring Airships

ON Thursday, April 4, at 6.30 p.m., at the Royal Society of Arts, Maj. G. H. Scott, C.B.E., A.F.C., will lecture before the Society on the "Handling and Mooring of Airships." In view of the approaching trials of R.100 and R.101, this lecture, and the one by Colonel Richmond on April 18, will be of outstanding importance. In his lecture, Maj. Scott refers to the great difficulties which must be experienced in handling and mooring the large-size airships now being built, and what the effect on design these difficulties have. He refers in his paper to the paper by Prof. Krell, entitled "Technical Conditions on the Landing of Large Airships," and points out the advantages of the suggestions which have been put forward by Prof. Krell. The lecturer deals very fully with the types of sheds which will be used, and also discusses the method used in the United States of providing short movable mooring masts to which the airship is first of all moored and then moved bodily into the shed with the mast. Maj. Scott shows that as the size of an airship increases it becomes increasingly difficult to land to a landing party, and more and more essential to land to a mechanically-operated system such as a mooring tower. Maj. Scott points out that in his opinion the airship pilot of the future will look with horror at the idea of landing to a landing party, a manœuvre only to be carried out in cases of extreme emergency. He sums up the whole problem and points out that nothing but actual experience is going to answer many of the questions which he himself raises in his paper.

Heston Aerodrome

THE new aerodrome at Heston, near Hounslow, which has been constructed by Airwork, Ltd., and full details of which have previously been published in FLIGHT, will be the venue for the start and finish of this year's King's Cup Race, which takes place on July 5 and 6. This race will be flown over a course of 1,100 miles up the East Coast to Edinburgh, then across to Glasgow and down the western side and along the southern side of England.

Aircraftsman Killed in Iraq

THE *Times* correspondent at Basra wrote on March 4 :—"I learn from an official source that news was received here on Sunday morning that a raiding party of Wahabi *Akhwan* was attacking some shepherd tribes grazing their flocks a little way outside Koweit town, where the sound of firing was at first audible. A formation of aircraft left Shaibah aerodrome, and before noon located the raiders at a spot about 20 miles south of Koweit. The raiders, who appeared to be about 600 strong, riding on half that number of camels, were engaged in driving off large flocks of sheep. They immediately opened fire on the machines, which replied with bombs and machine-guns. The raiders then made off towards the Nejdi frontier at great speed, but it is not yet known what their losses were. They are believed to be members of the Mutair tribe, and among the tribes which they raided was the Iraqi tribe of Beni Malek. Aircraftsman Knight, wireless operator in one of the R.A.F. machines, was killed."

PUBLICATIONS RECEIVED

The Second Report of the Guggenheim Fund for the Promotion of Aeronautics, 1928. The Daniel Guggenheim Fund for the Promotion of Aeronautics, 598, Madison Avenue, New York.

Flughandbuch fur das Deutsche Reich. Containing Maps, Aerial Views, and full particulars of all the German Aerodromes. Published by the Reichsverkehrsministerium, Berlin.

S.M.A.E. Journal. February, 1929. The Official Organ of the Society of Model Aeronautical Engineers, 20, Thurlby Road, Wembley, Middlesex. Price 6*d*.

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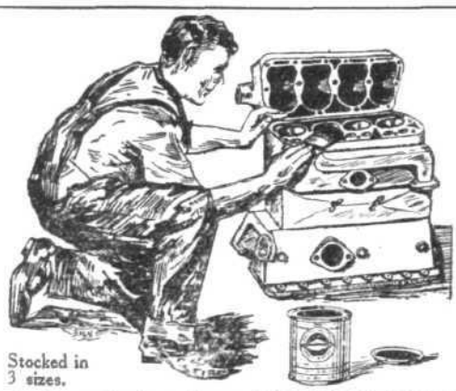
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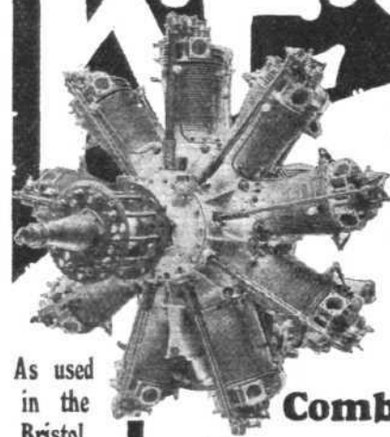
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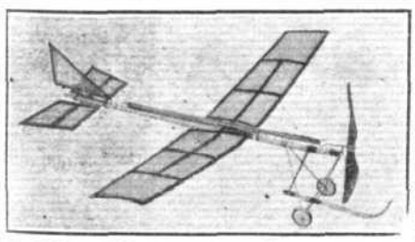
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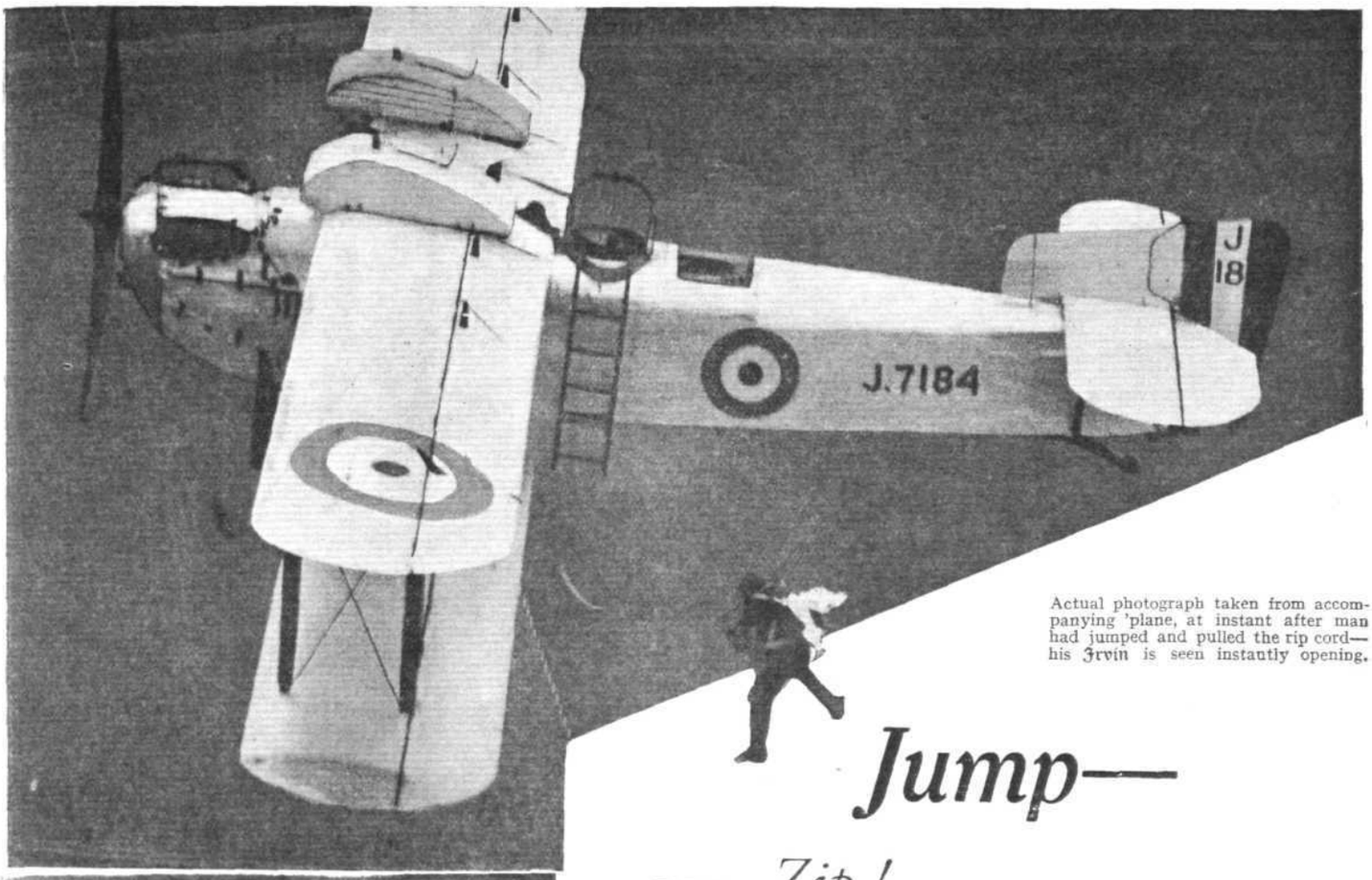
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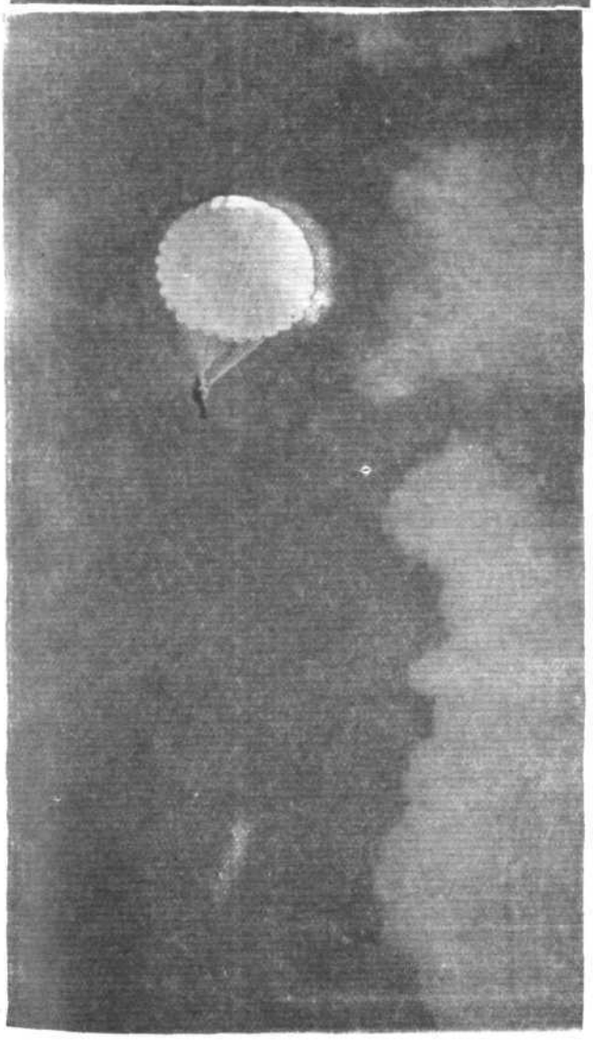
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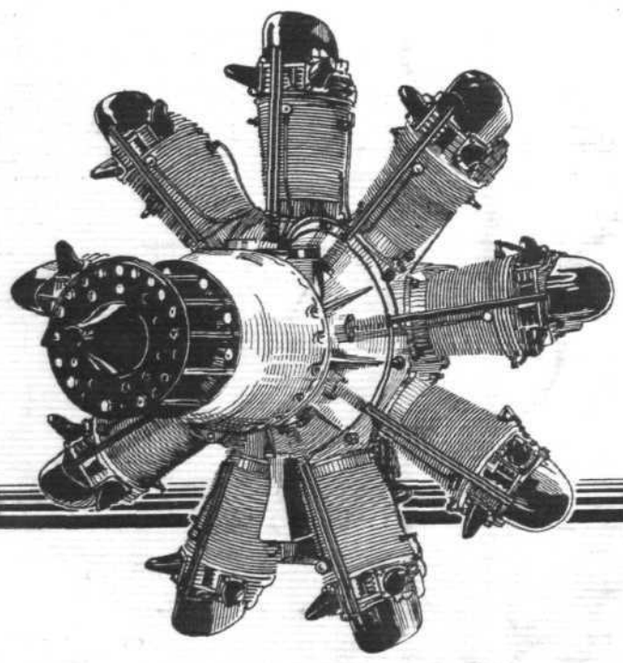
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